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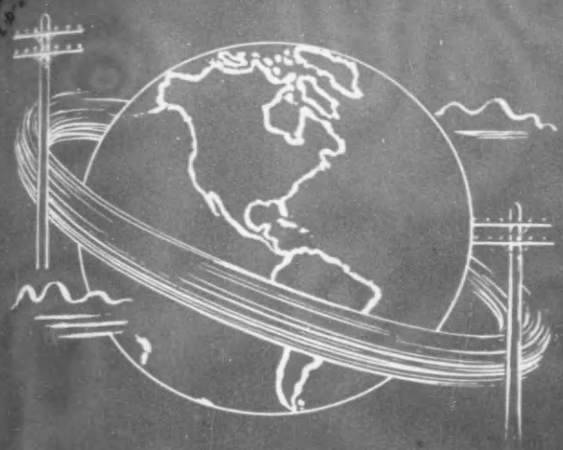

MAINTENANCE & CONSTRUCTION NUMBER

TELEPHONE ENGINEER AND MANAGEMENT

THE NATIONAL TELEPHONE MAGAZINE

VOL. 48, NO. 4

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LINE UP WITH *Kellogg* FOR LINE SUPPLIES ★

With the press of getting this Spring Maintenance Number to you we almost forget to tell you of our coming issues, and, to announce a forward step that to us is considered a milestone in our progress to bring you an outstanding industry magazine. Starting in our next issue TELEPHONE ENGINEER & MANAGEMENT will inaugurate the first of a series of articles on management by outstanding authorities in our industry. These articles are being written exclusively for this publication and will be available through no other source. The first article will be on employee relations and will come from the pen of John H. Agee, possibly the outstanding authority in our industry on this subject. Mr. Agee has headed the USITA Committee dealing with wages, hours and employee relations for many years. He is vice president and general manager of the Lincoln Tel. & Tel. Co.

▼

This is being written the week before the Executive Conference in Chicago on April 20 and 21. The Illinois Telephone Association will convene on the 18 and 19 at the Edgewater Beach Hotel to be followed, at the same hotel, by the Executive Conference. Both of these meetings will be well attended and we hope to see and greet many of you, our readers, at that time.

R. W. S.

TELEPHONE ENGINEER AND MANAGEMENT

Vol. 48, No. 4 APRIL, 1944

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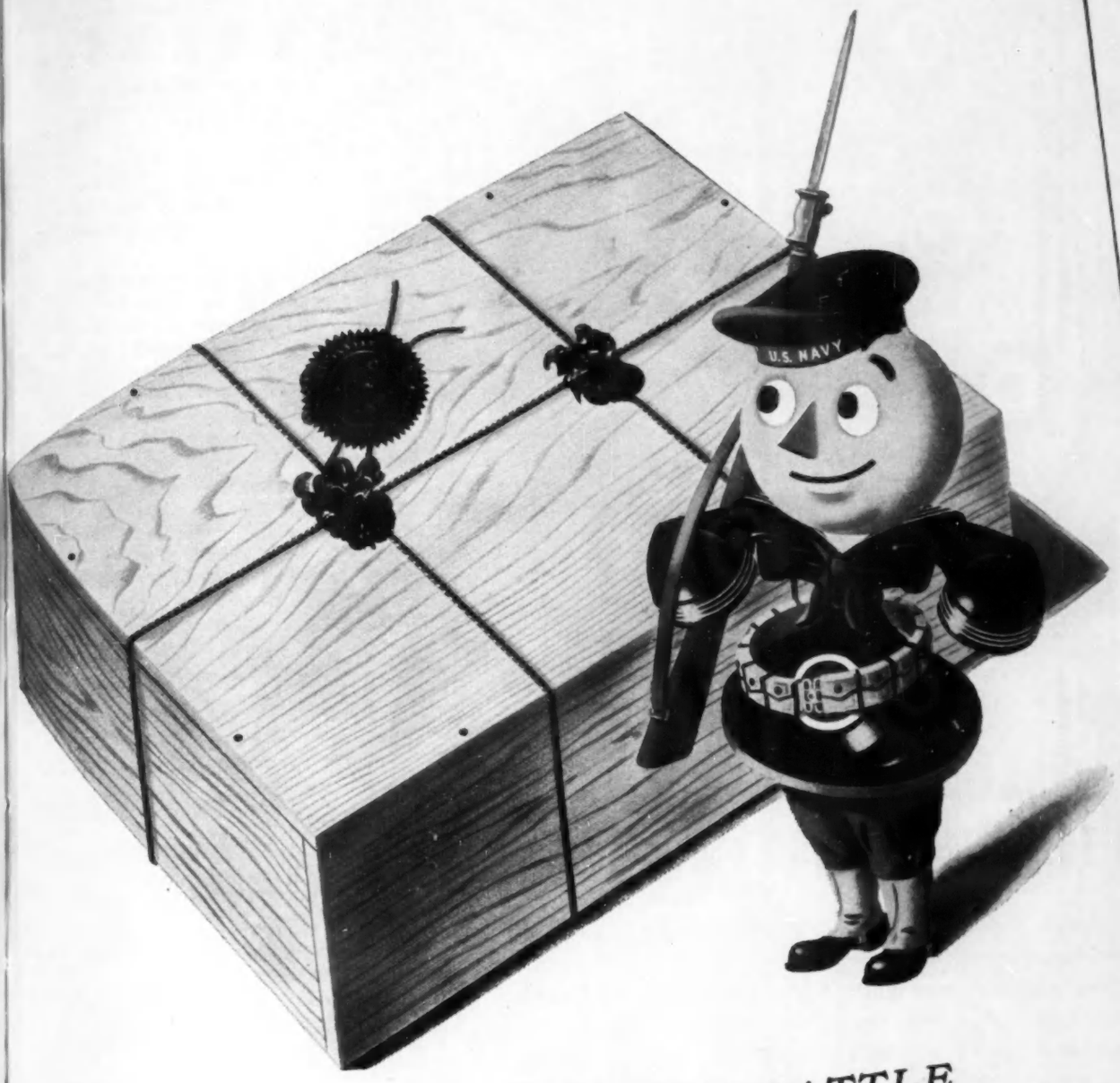

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LETTERS

from TELEPHONE ENGINEER readers

Dear Mr. Smith:

This is to say from April 15, 1944 send TELEPHONE ENGINEER to our home address. . . . R. O. Palmer, Merrifield, Minnesota.

I should have thanked you ere this for the copy you sent to our friend, Mrs. F. W. Webber in Minneapolis some time ago. It was appreciated and enjoyed. Only yesterday I heard from Mr. Palmer in Alaska that several have surprised him with letters about his letter and writeup to you. How pleased any of our men there are to receive mail. He also discovered one of his good customers, the owner of the Walker (Minn.) Telephone Company, out in Alaska. His name is Joe Steinhagen. Another who is doing his bit to help Uncle Sam on line work. It's a small world.

Cordially yours,
Mrs. R. O. Palmer,
Brainerd, Minnesota

(Ed. Note—Mr. Palmer has also written us of meeting friends following our reproducing his interesting letter.)

◆

Gentlemen:

Regarding your letter of March 6, I am a subscriber to the TELEPHONE ENGINEER AND MANAGEMENT. The address you mentioned is mine. I prefer having the magazine sent to my former residence and from there it is forwarded to me.

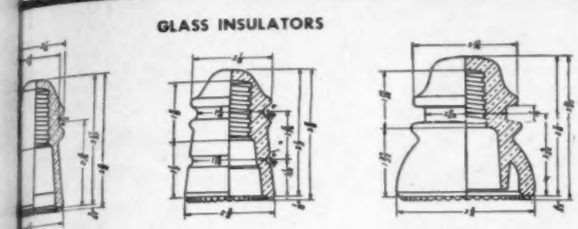
While reading my March issue of the ENGINEER, I read the question regarding an alarm system for indicating insulation failure to ground of a cable pair due to dampness etc.. I might add that I know of another system which might be used with success.

It is a circuit which appeared in an issue of the Bell Laboratories Record. As can be seen from the enclosed drawing, the sounding of the alarm depends upon a change of grid bias which occurs when the cable wire resistance is lowered below the standard of five megohms. The standard resistance may be set to any desired value. The switching circuit may be added if it is desired to test a number of cables.

I hope that the above data may be a further aid to the inquirer's problem.

The text entitled "Fundamentals of Telephony" arrived today and I might say that it promises to be very enlightening.

Very truly yours,
John W. Sponsler, T/5
Company "A" 933D Signal Battalion



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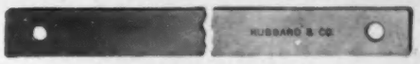

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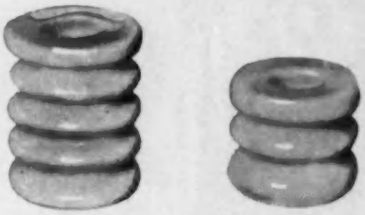

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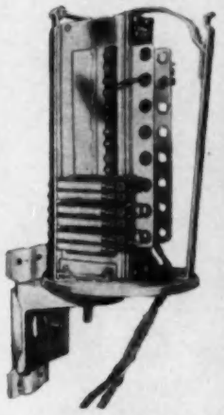
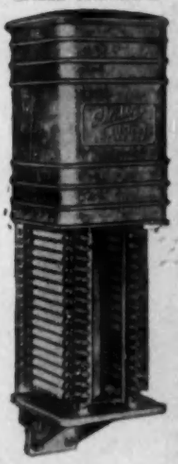


TYPE S-20 CABLE TERMINAL



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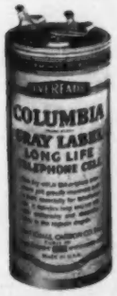

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he Edgewater Beach Hotel, Chicago, Week of April 17th

EDITORIAL

Springtime is Maintenance Time

It may be true that in the Spring "the young man's fancy lightly turns to thoughts of love"—but the telephone man's thoughts are more likely to turn to the job of fixing up his plant.

This is the time of the year when, with the ice and the slush of Winter departed, we can get out and repair the ravages of Winter on poles and lines and other parts of the plant.

In the years before wartime shortages of materials and manpower, we thought of this season as Spring construction time. Now, even though some materials that were very critical are somewhat more plentiful, our work must be confined almost wholly to maintenance. Construction will be limited this year to a few jobs sufficiently necessary to the progress of the war that they can obtain the approval of governmental authorities.

We can do maintenance, however, and we should. That will not only permit us to maintain a higher standard of service, but it delays replacement and thereby conserves for the time being materials and manpower now useful to the war, but which will be plentiful after the war has been won.

We believe that one of the industrial and management marvels of this war period has been the reduction by the telephone systems of the nation of their use of critical material and their supplying under such circumstances, of a surprisingly high quality of telephone service. As everyone who has studied the figures knows, the reduction by telephone companies in the use of materials during wartime has been tremendous.

A substantial part of this reduction in the use of materials came, of course, from the using up of spare plant and equipment facilities existing when the shortages began, together with the elimination of the expansion of the properties that would normally have taken place. An important part of the savings of materials was made possible, however, by another factor—that good, old-fashioned faculty known as American ingenuity.

The use of that ingenuity—the ability to find and apply different ways of doing things in order to save materials and manpower—has meant in many cases a distinct departure from engineering and operating practices that the industry had found by experience to be best in the long run. For the time being and because of necessity, expediency has been the rule.

We are still in the war, and while some materials that were critical are now somewhat more plentiful, we shall still have to use our ingenuity to the utmost in order to give every possible help toward victory.

This situation does not, however, diminish the wisdom of or the necessity for proper maintenance. In fact, careful maintenance is itself a method of conserving the use now of materials and manpower, by delaying the necessity for a greater use of those things until the day has come when they are plentiful and when it is for the good of the nation, and consequently for the good of the telephone industry, that things providing employment be done.

That day will come. Nobody knows now just when, but it will come. Then telephone plants can be brought up to their normal standards of efficiency and excellence, and badly needed extension work and new construction can be done.

We are helping to hasten that day by doing now all the plant maintenance work that can be done now.

Wartime Maintenance of Outside Plant

By J. S. REED JR.

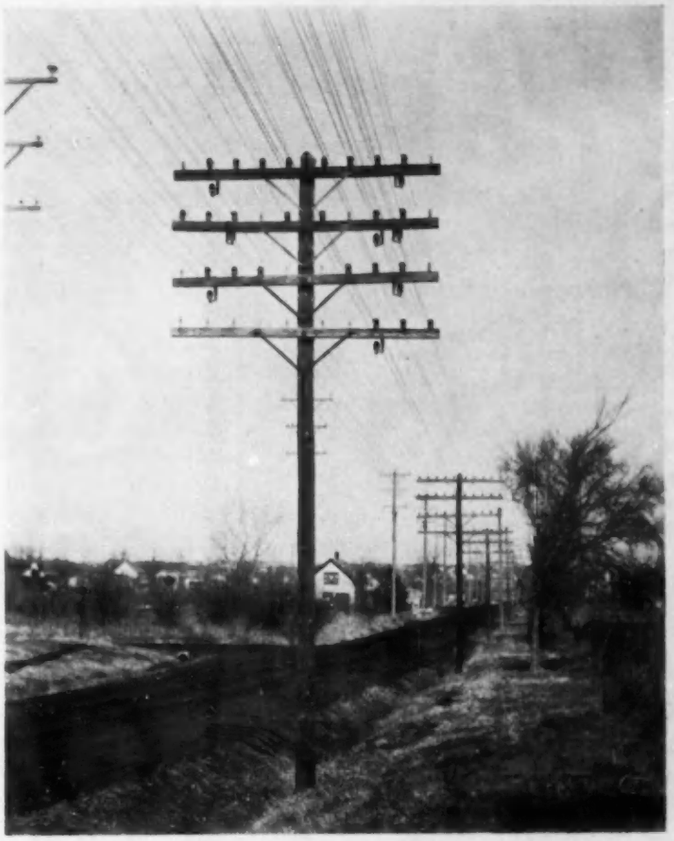


Fig. 1—A well constructed open wire lead.

General

BECAUSE of the value of telephone lines to the war effort, W.P.B. orders provide that present telephone lines shall be maintained at their highest peak of efficiency possible under present circumstances. It is therefore the patriotic duty of telephone companies to continue the proper maintenance of their lines.

Spring is a good time to start the annual overhaul of outside plant to put it into shape for the year and to complete the final repair of damage done by winter storms. This article discusses maintenance of open wire plant that is possible under present war time conditions.

Open Wire Maintenance

THE purpose behind the proper maintenance of open wire leads is to keep as high a level of transmission as possible so subscribers will be able to carry on normal conversations at all times. In addition the components of open wire leads must be kept in good condition so that no service interruptions will result from line failures under storm conditions. Figure 1 illustrates a well constructed open wire lead.

Although it is true that a well built pole lead can be provided by good construction based on sound design that makes use of poles of adequate strength within the limits of the safety factor of the pole lead, it is also a fact that a good open wire line can deteriorate badly as the result of neglect over a period of years. Poles and their attachments tend to deteriorate more or less on exposure to weather. For example, crossarms tend to split at the ends and rot around the insulator pins. Insulators may break or crack, or may come entirely off the crossarm as "floaters". In addition, line wire splices and test connections may go "high" and cause noise and poor transmission.

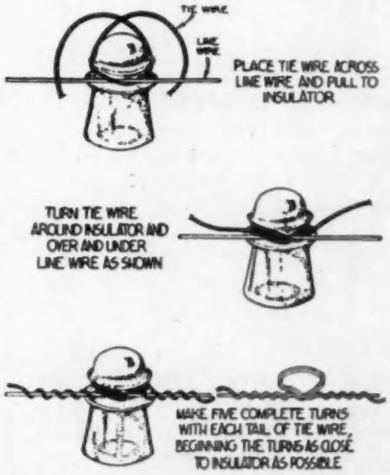

TIE WIRE
LINE WIRE
PLACE TIE WIRE ACROSS LINE WIRE AND PULL TO INSULATOR
TURN TIE WIRE AROUND INSULATOR AND OVER AND UNDER LINE WIRE AS SHOWN
MAKE FIVE COMPLETE TURNS WITH EACH TAIL OF TIE WIRE, BEGINNING THE TURNS AS CLOSE TO INSULATOR AS POSSIBLE

Fig. 2—Method of making a standard copper wire tie. Top: step (a); center: step (b); bottom: step (c).

A definite plan for overhauling the open wire plant should be followed. The most satisfactory one is to send a plant maintenance man over a planned route following wire leads and farm line spurs to the end. On his trip he drives his car slowly along the route of the pole lead, looking for line defects and ready to make any necessary repairs. To save return trips, his car should be fully equipped with the right kind of materials and tools.

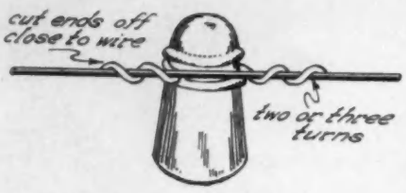


Fig. 3—Standard iron wire tie.

Maintenance of Poles and Pole Attachments

THE pole lead naturally receives the first consideration in the spring maintenance program since it is an essential support of the overhead line wires and bears the brunt of adverse weather conditions.

Poles should be replaced if they contain woodpecker holes that occupy one-fourth of more of the pole cross section, and have split or broken pole tops or other storm or lightning damage that weakens the pole dangerously. Poles that are too short for the locations indicated in Table 1 should be replaced.

On pole leads that have been in service many yearse and are approaching the end of their service life, it is advisable to make pike pole tests to determine the internal condition of poles that appear normal. In this test a 10-foot pike pole is thrust against the pole approximately twelve feet up and at an angle of 45 degrees. If the strength of one man for a six-wire lead or of two men for a ten-wire lead is not suffifficient to break the pole, the pole is considered satisfactory.

An important precaution should be noted here. If it is necessary to climb a pole for any reason, the pole should be first tested for a weakened condition. If the climber entertains any doubt about the ability of the pole to hold his weight, he should guy the pole with hand lines or reset the pole temporarily before starting his climb.

Occasionally a pole may be found to have broken below the ground line, but is held more or less upright by the wire lead. A pole in this condition will place a severe strain on the wire and on attachments on other poles, and should be replaced as soon as possible.

In northern communities, poles have a tendency to become loose in their holes as the result of frost heaving. This condition should be corrected by thoroughly tamping the earth around each loosened pole until the latter is firmly set in place.

Poles do not need to be exactly vertical as long as they are firmly set in the ground. In ten-pin crossarm leads poles may lean out of vertical by not more than one foot in ten feet of height, and in six-pin crossarm leads, the amount of pole lean may be as much as one foot in ten feet of height.

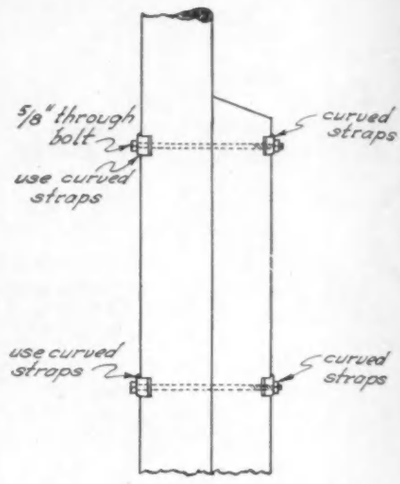


Fig. 4—Method of stubbing poles.

East and West Sections of Pole Line

SPACING			Minimum Length of Pole	Pole Size Class	FIXTURES			
No. of Wires	Ft. in Span	Poles per Mi.			No. of Bkts.	No. of Crossarms *4-Pin	*6-Pin	8' 6"** 10-Pin
2	210	25	16'	10	1-2			
4	210	25	16'	10		1		
6	210	25	16'	9			1	
8-10	210	25	16'	8				1
12-14	210	25	20'	8	1-4			1
16-20	146	36	20'	8				2
22	146	36	20'	6	1-2			2
24-30	132	40	20'	5				3

North and South Sections of Pole Line

2	250	21	16'	10	1-2			
4	250	21	16'	10		1		
6	250	21	16'	9			1	
8-10	210	25	16'	8				1
12-14	210	25	20'	8	1-4			1
16-20	176	30	20'	8				2
22	176	30	20'	6	1-2			2
24-30	146	36	20'	5				3

* Crossarms shall be substituted for brackets at driveways, highways or other locations where the use of brackets would require a longer pole.

**10'10-pin crossarms may be substituted when recovered crossarms cut to 8' 6" are available. Crossarms of same length should be grouped in continuous sections.

Table No. 1—Pole Spacing Tables for Heavy Loading District.

Crossarm Defects—Broken Insulators

CROSSARMS that have long been in service may rot around the insulator pins, allowing the latter to sink through the crossarm so that the insulators rest directly on the arm surface or are pulled out to become "floaters". Crossarms found in this condition must immediately be replaced.

Crossarms may also split at the ends with the danger that the pins at the ends may pull out, especially on corner poles. Whenever crossarms in this condition are found, they should be replaced with a new arm. Since the splitting condition usually occurs only at the ends, it is possible to convert otherwise good arms into six-pin arms by sawing off the split ends.

Broken insulators are often found. Sometimes an insulator becomes cracked entirely through and may not be readily detected unless the tie wire is removed for some reason. Defective insulators should be immediately replaced with a new one since the movement of the wire in wind may cause it to rub against a sharp edge of the broken insulator resulting in nicking the wire and eventually breaking it.

Tie Wires

Tie wires tend to become loosened after some time and must be remade each time this condition is detected.

The exact method of making a wire tie is very important. This is espe-

cially true on copper wire leads since badly made copper wire ties will "burn" the hard-drawn copper tie wire and cause expensive damage. At the time when conservation of copper is vital to the war effort, the loss of good copper wire as the result of this kind of preventable damage is even more serious.

To make a copper wire tie, use a soft-drawn or annealed copper tie wire 24 inches long of the same gauge as the line wire (.104). Hold the tie wire in both hands and pass the center portion over the insulator and wire as shown in Figure 2(a) and (b) and then twist each end in opposite directions as shown in Figure 2(c), giving five complete turns to the tie wire on each end as shown. It is important that only the hands be used, not a pair of pliers, and that the tie wire is pulled up sufficiently to hold the line wires tightly against the insulator before twisting the tie ends around the wire.

To make an iron wire tie, take a twelve inch length of ordinary BB wire and bend it into an "U". Place the "U" portion over the insulation and using both hands, bend the ends of the tie wire upwards and over the line wire, wrapping the tie around the line wire two times. The last quarter turn is cinched by drawing the end of the tie wire over the line wire tightly with pliers. The method of making this tie is shown in Figure 3. Cut off the ends close to the wire. Although the removal of the surplus wire ends is a standard practice, many maintenance men prefer to bend these ends back to facilitate later removal of the ties.

Resetting Poles— Use of Pole Stubs

IN the case of an otherwise good pole that is broken at the ground line or badly decayed below this line, many companies follow the practice of cutting off the defective portion of the pole and then resetting the pole.

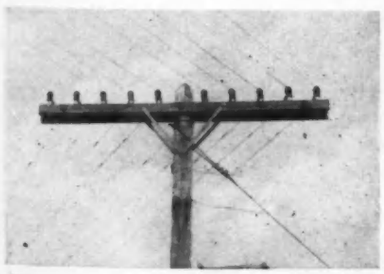


Fig. 5—Example of good corner pole construction.

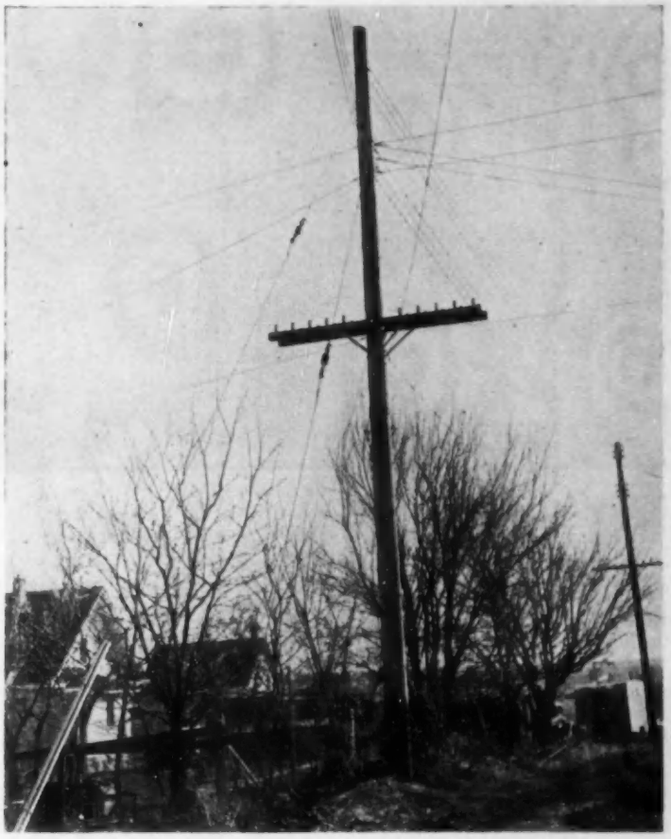


Fig. 10—Showing Typical Construction of a Crossarm Dead End for a Joint Pole Lead.

The proper method to follow is to lift the pole, if it is not broken, out of the ground about one foot with a pole jack, and saw the pole through at the ground line or just below it. The upper portion of the pole is then lifted off and set aside about a foot away. The stump of the pole is then pulled out and all slivers of rotted wood carefully removed from the hole to prevent any possibility of re-infecting the pole from this source. The pole is then lowered into the hole and the earth around the pole thoroughly tamped.

If an untreated pole is being reset, the life of the pole may be extended somewhat by treating two feet of the pole from the ground line towards the butt and one foot of the pole above the ground line before setting the pole, using cold creosote for the preservative.

Poles that are to be reset should meet the following requirements:

1. Length and size according to Table No. 1. This requirement is less strict for light loading areas.

2. Depth of pole setting as given in Table No. 2.

3. Condition of pole butt. If the pole has a hollow center with less than 2½ inches of solid wood left in a ring around the hollow, it should not be reset. If ant tunnels are evident throughout the cross-section of the stump of the broken or cut pole, it is advisable to replace the pole entirely.

It is often economical to bolster a weakened pole by means of a pole stub, provided that the upper position of the pole and the pole attachments are in good condition. A method suitable for stubbing small poles is illustrated in Figure 4. The surfaces of the pole and the stub are shaved at the points where they are to come in contact so as to produce a flat surface. A hole is dug close to the pole to approximately the same depth as that of the pole and the stub is then placed in it. After the bolt holes are drilled and the bolts tightened in place, the dirt is shoveled back in and the earth tamped to

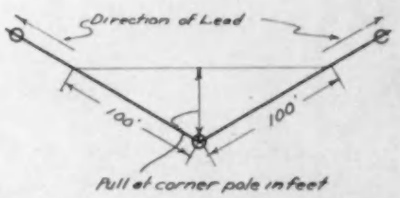


Fig. 6—Explanation of the term "pull on corner pole."

Total No. of Wire to be Carried	Length of Pole	East & West Lines Depth of Holes	North & South Lines Depth of Holes
4	10	2' 6"	2' 6"
10	15	3' 6"	3' 6"
6	20	3' 6"	3' 6"
8-10	20	4'	3' 6"
12-14	20	4'	3' 6"
16-22	20	4'	4'
24-30	20	4' 6"	4' 6"
6	25	4'	4'
8-10	25	4' 6"	4'
12-14	25	4' 6"	4'
16-22	25	5'	4' 6"
24-30	25	5' 6"	5'

Table No. 2—Pole Setting Depths for Rural Areas in Heavy Loading Districts.

firmly set the pole and the stub.

It is inadvisable to stub a dead end or a corner pole because of the tendency of the down pull of the guy to place a strain on the stub bolts or ties, causing them to give and throw the pole out of its normal position.

Vertical Wire Clearances

CLEARANCES of open wire above the ground should be carefully observed to avoid the possibility of damage suits in cases of accidents caused by a low wire. Clearances lower than legally permitted may happen as the result of resetting poles. Table No. 3 gives the legal clearances required for the different localities listed.

One method of obtaining a desired clearance for the lower wires of a two cross arm lead is to raise the lower crossarm to result in either 18-inch or 12-inch spacing between the upper and lower crossarms instead of the regular 24-inch spacing. For the 12-inch spacing it is not necessary to change the position of the upper arm braces since the lower crossarm can be bolded directly over them without any trouble. For an 18-inch spacing of the crossarms the upper crossarm braces must be relocated in a new position. This is accomplished by drilling new brace bolt holes in the upper crossarm, each one 4 inches outside the original bolt hole and bolting the braces through the new holes. The position of the braces on the lower arm need not be changed.

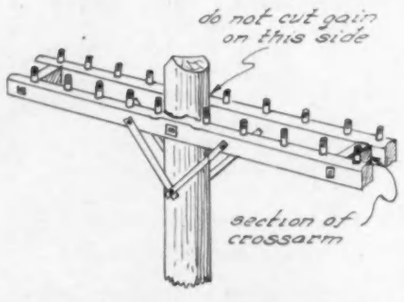


Fig. 7—Double arm construction.

Pole Corners

POLE corners occur wherever there is a change in the direction of the wire lead. This part of the lead requires the attention during each maintenance period due to the tendency of guys becoming slack and allowing the line to pull the corner pole out of its normal position, unless the guys were properly placed and attached to anchors of adequate size in the original installation. Figure 5 illustrates a well built pole corner.

In general, for a two-wire bracket lead a corner pole should be guyed where the pull is 6 feet or over, and a pole lead with any number of wires over two will require guying if the pull is over 3 feet. The "pull" of a guy on a corner pole is explained in Figure 6.

For pole corners with less than 50 feet pull (inside angle of 60 degrees) a single guy is usually sufficient, but if the pull is greater than this value, two guys are needed, one each to hold the pole in the direction of the lead away from the corner. In addition, a double arm (consisting of two cross arms bolted together shown in Figure 7) should be used to reduce the strain that might twist a single arm out of shape. Each line wire is tied to an insulator on each arm so that the strain will be taken up by both arms.

To relieve strain on tie wires, line wires should always be placed on the insulators so that the pull is on the insulators themselves rather than on the ties.

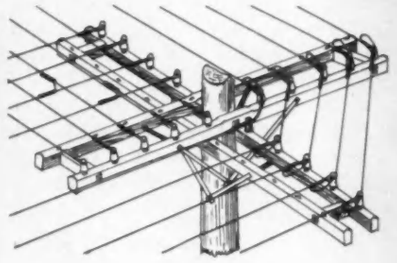


Fig. 8—Construction of a buck arm corner.

The amount of rake to give a corner pole is important only on very heavy wire leads where considerable strain on the guy can be relieved by tilting the pole away from the line so as to cause it to bear much of the strain that would have otherwise been placed on the guy. Corner poles on light leads need only a slight rake. It is permissible to have as much as three feet lean out of the vertical at the top; provided the corner pole is well guyed so that no further leaning will occur. Otherwise it will be necessary to reset the pole and retighten the guy.

Buckarm Corners

BUCKARM construction is utilized at right angle corners in wire leads in preference to single or double arm construction so that the crossarms can properly take the strain resulting from the pull of the line on the corner pole.

A mistaken conception that the crossarms should be separated the standard distance on the pole results in a very poor construction which is a source of line trouble. The proper construction is to place the double arms at right angles on the pole and not more than an inch or two apart. This method is illustrated in Figure 8.

If more than ten wires are carried on the corner pole, crossarms with 32 inch spacing between the pole pair pins, instead of the standard 16 inches

(Please turn to page 68)

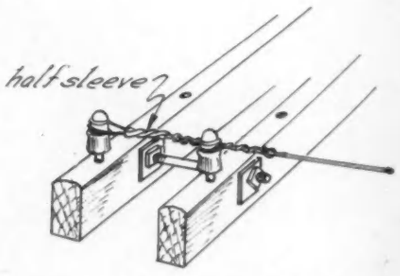
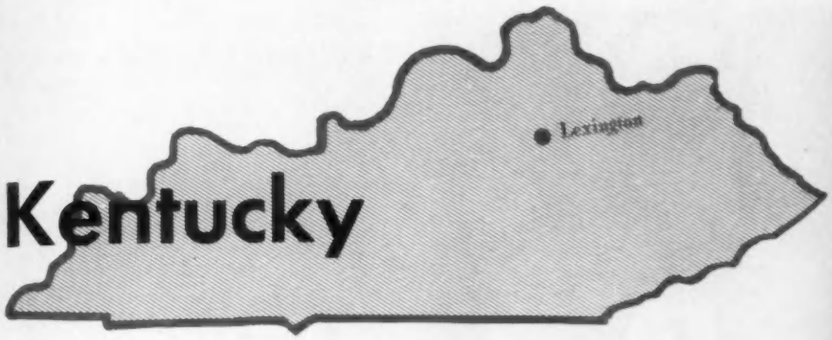


Fig. 9—Method of terminating line wires on a crossarm dead end.



Kentucky Convention Report

H. S. Poage, Augusta, is the new president of the Kentucky Independent Telephone Association.

By RAY W. SMITH, Editor

"The Biggest Little State Telephone Association in the U. S." is a good name for the Kentucky Independent Telephone Association which concluded its one day convention in Lexington April 5. Possibly the largest attendance in association history was noticed by this writer with everyone attending the all-day session. A varied program was presented covering wartime practices, armed forces co-operation, traffice and plant. The convention adjourned following the banquet at which Clyde S. Bailey, executive vice president of the United States Independent Telephone Association was the principal speaker.

Officers elected for the coming association year were: president, H. S. Poage, Augusta; vice presidents, R. A. Maybury, Glasgow, L. O. Evenson, Lexington, and E. G. Stephenson, Florence; secretary-treasurer, D. H. "Doc" Lloyd, Lexington.

Directors elected by the convention were: Mr. Maybury; L. F. Seawell, Elizabethstown; G. A. Weatherly, Wingo; Mr. Lloyd; J. N. Johnson, Ashland (the retiring president); Mr. Evenson; Mr. Poage; W. E. Dunn, Hazard, and Mr. Stephenson.

The writer wishes to thank the Messrs. Johnson, E. L. Malone, the retiring secretary treasurer and Burton W. Saunders, the retiring vice president, for their assistance and hospitality during the convention.

Promptly at 9:30 the doors of the convention hall were closed and a $25 War Bond was awarded as a door prize. The attendance was large and justified the decision to move the convention from its usual winter date to a spring date. The invocation was read by D. B. Corman, district sales manager of the Kellogg Switchboard & Supply Company to open the session. President Johnson then called the meeting to order and introduced Mayor Oldham of Lexington who delivered the welcoming address. The response was given by Mr. Evenson who was addressing his now fellow Kentuckians for the first time. Mr. Evenson was recently appointed (TE&M March 15) vice president and general manager of the Lexington Telephone Co.

In introducing Secretary-treasurer E. L. Malone to give his report President Johnson reminded the members in attendance that Mr. Malone was resigning to take up his duties in Indiana. His report was read and after the usual audit was accepted by unanimous vote.

Judge George R. Hunt, a director of the Lexington company and a born Kentuckian, was the next speaker with the subject of "Kentucky". His comments, interspersed by much dry wit and humor, gave many adopted sons of Kentucky much of the folk lore of the state and its citizens. Judge Hunt is a practicing attorney in Lexington and has served as both city and county attorney there.

R. C. Reno, Chicago, editor of our worthy contemporary, addressed the meeting on the subject "The Small Telephone Company Problems".

Colonel Carroll Badeau, Commandant, Lexington Signal Depot, and

"The Board of Strategy" meets after morning session at Kentucky Convention. (l. to r.) D. H. Lloyd, Sergeant-at-Arms, Burton W. Saunders, v-p., J. N. Johnson, president and E. L. Malone, sec-treas.

Helen Childers and Lucille Brookshire of the Lexington Telephone Company are registering Edwin S. Blakeslee, Lafayette, Ind.; Leich's Roy W. Siemund and Burton Saunders before opening of the 1944 Kentucky Convention.

formerly an engineer with the New York Telephone Company, spoke on an off-the-record subject addressed only to telephone people present at the convention and his remarks and subject cannot be discussed. He gave his listeners some very valuable information that will assist them materially in the future.

M. W. McFarlin, special agent in charge, Federal Bureau of Investigation, Louisville, was the final speaker at the morning session. His subject, "The Wartime F. B. I." was also an off-the-record address to those in attendance and was barred from publicity by the press. Needless to say his every word was interesting and informative. He, as did, Colonel Badeau, cited several times during his address the wonderful job being done during this war by the telephone industry.

Following luncheon the final session began with the address of J. M. McAlister, Kentucky manager for the Southern Bell Tel. & Tel. Co., Louisville. His subject "The Telephone Industry's Postwar Outlook" aptly describes his talk as he pictured many developments that might be expected.

R. A. Maybury, Southern Continental Tel. Co. and vice president of the association, was the Chairman of the commercial portion of the program which consisted of a number of skits presented showing how problems of wartime operating practices should be met. He was ably assisted by Orville Esters, Cave City, and Mrs. Minnie Aspley of Glasgow. The skits were well presented and Mr. Maybury, acting as a company representative, was particularly effective with his demonstration on answering involved questions presented by his assistants who represented different types of telephone subscribers.

H. B. Bearden, principal consultant, Public Service Commission of Kentucky, Frankfort, was the next speaker. His subject was a highly controversial one namely "The Perpetual Inventory—Why?" After endeavoring to explain why this method is, in his personal opinion, a good one and after tracing the history of this moot question Mr. Bearden asked for questions from the floor. There were few questions and those asking were not too well satisfied with the answers.

After the Auditing Committee and Nominating Committee reported, the audit was okayed and the directors selected by the nominating committee unanimously elected, the convention was both entertained and educated by the demonstration put on by Traffic Chairman and general traffic superintendent of the East Central Group of the General Telephone Corporation ably assisted by a number of employees of the Lexington company.

Under an overall name on the program of "Today's Typical Traffic Topics" the various demonstrations in the way of skits were presented that the entire membership might see how traffic problems happen and how they may be solved. One of Mr. Willis' assistants served as narrator of this part of the program ably assisted by at least 12 other young women of the organization. They demonstrated how management in personnel could and would produce if handled diplomatically and with proper feelings toward employees. The skits also included demonstrations on what part the operators and women employees might help in the war effort in spare hours. Mr. Willis is to be congratulated for the professional way in which his assistants handled their assignments.

W. H. Baker, administration assistant of the War Manpower Commission, Louisville, substituted for his boss W. C. Burrow who was unable to attend. His address on "Current Manpower Problems" was very informative to the telephone people present. He stated that manpower (either male or female) was becoming more scarce with the barrel scraped clean and not even the barrel left. He admitted he did not know the answer, however, he did suggest that women would have to take up the slack in vital industries of which the telephone company is one. He predicted that almost every man between 18 and 26 would be drafted. (See Highlights of the Communications News by Roland C. Davies—this

R. A. Maybury (seated) and Orville Esters demonstrate a commercial skit during the Kentucky meeting.

Retiring Kentucky Association President J. N. Johnson and your Editor are snapped by camera "fiend" Burton W. Saunders.

L. O. Evenson, (left), Mrs. Evenson and H. B. Bearden are pictured relaxing before the Kentucky convention banquet.

issue—for more information on this subject.)

The final portion of the program was handled by R. H. Harlow, field plant superintendent of the Sahland Home Telephone Company and Chairman of the Plant Committee. His subject "Telephone Plant Recipes—What's Cookin'?" was appropos as were his assistants who aided him in demonstrating on equipment placed on the stage to properly present the subject. His assistants were the Messrs. Seawell, Moran and Belcher. Mr. Moran is with the Portsmouth (O.) Home Telephone Company.

The meeting of the new board of directors was held immediately after this final subject was completed and officers elected for the year. The directors thanked the Messrs. Saunders and Malone for the years of service they had given to the association.

The banquet began promptly at 7 with Mr. Willis being in charge of tickets. Entertainment was furnished by the Lexington Lions' Club Jug Band and the University of Kentucky Troopers with the highlight of the entire convention being the address by Mr. Bailey. The invocation before the banquet was given by E. L. Malone.

"The United States Independent Telephone Association is very greatly interested in the problems of the smaller Independent telephone companies and wants to work with the State Associations in aiding the little companies, particularly the single exchange companies with their small staffs," Clyde S. Bailey, Executive Vice-President of the U. S. Independent Telephone Association told the Kentucky Independent Telephone Association at its annual meeting April 5 at Lexington, Ky. He added that it is a mistake for the small company not to use the facilities of the national and state associations.

Mr. Bailey discussed briefly the subjects and problems of significance for the telephone industry in Washington. He commented in regard to the WPB orders relating to telephone companies that it isn't the orders that trouble the companies but the complex language contained in them. He related that the telephone industry was one of 35 industries listed by the War Manpower Commission as essential to the war effort.

As is customary during wartimes, the manufacturers did not exhibit equipment but many of them had representatives on hand to counsel with their customers. In fact, these manufacturers materially assist any convention by sending their representatives with complete knowledge of priority problems on necessary items that must be obtained to continue good service.

Might Close Exchange—Drafted!

Bernard Knuth, manager of the Woodstock (Minn.) Tel. Co., has made application to the Minnesota commission for permission to suspend operations of the exchange as he is slated to be drafted into service.

Citizens of the Woodstock area petitioned the county selective service board asking an indefinite deferment of Mr. Knuth.

Following Directors' Meeting after sessions we snapped Clyde S. Bailey, Washington; President-elect, H S. Poage, Augusta; D. H. Lloyd, Lexington; J. N. Johnson, Ashland; and R. A. Maybury, Glasgow.

By G. S. GILL
Associate Editor &
Development Engineer

A Telephone Maintenance Car

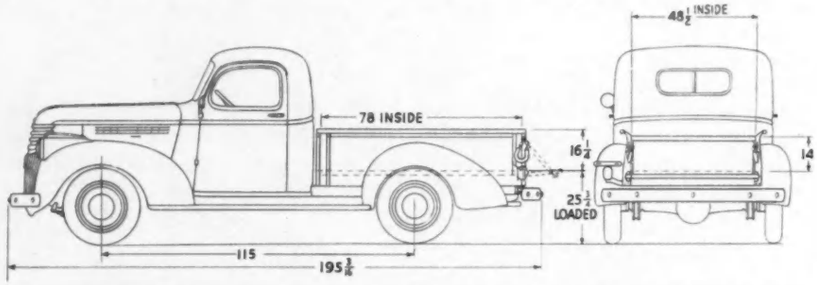


Fig. ½-ton light delivery truck suitable for conversion into a telephone maintenance car.

NO matter how small a company may be, a maintenance car is always a good investment. The experience of telephone men everywhere has proven that a well designed exchange service car pays for itself many times over in time and labor saved on maintenance jobs.

Much of the work involved in maintenance of outside plant is of a preventive nature; that is, the plant is inspected regularly and defective conditions corrected in plenty of time to avert a breakdown in service to subscribers. A service car enables the maintenance man to patrol routes of pole leads and make repairs or replacement of defective line equipment on the spot. For example, he may observe that a pole guy has become slack or that an insulator is broken.

Fig. 3. Rear view of simple body design (Courtesy of American Coach & Body Co.).

He has only to stop his car and go over to the pole in question and pull up the loose guy or replace the broken insulator with a new one taken from the stock of material carried in his car; each job being a matter of a few minutes when the necessary tools or material are available on the spot. If the vehicle has been correctly designed to carry the necessary tools and line material, the maintenance man will have no trouble in making all needed repairs. Unlike the plumber's unfortunate assistant, he will have no need to return to the exchange storeroom for a forgotten tool or a missing item of material.

Type of Car Needed for Service Work

AS a matter of economy and convenience, an exchange service car should be capable of being used for installation as well as maintenance work. Such a vehicle should have the following features:

1. A versatile and economical type of commercial chassis for the basic automotive unit.

2. A properly designed compartment body with a well-chosen stock of items of material needed for plant maintenance as well as subsets and subset parts.

3. A rack for carrying necessary large tools for maintenance work.

4. Equipment for reeling in or paying out drop wire.

5. A substantially constructed drawbar for hauling pole trailers.

The design of a maintenance car may be as simple or as elaborate as the size and financial ability of the company permits. The foregoing features represent about the minimum requirements that will result in an economical and efficient design.

A company having as few as 200 stations can afford a maintenance car of simple design. One car will take care of an exchange having 300 stations and the average amount of toll plant.

This article covers several types of exchange cars suitable for maintenance work on outside telephone plant.

Description of Typical Telephone Maintenance Cars

FIGURE 1 illustrates a basic type of automotive unit that is ideal for conversion into an exchange maintenance car. This type of vehicle is a ½-ton commercial chassis with pick-up body used for light delivery work.

A simple compartment body design is shown in Figure 2. Compartments and a tool rack have been mounted on the original pick-up body. The result is a compact arrangement of compartments, trays, racks, and holders that in effect converts the car into a traveling storeroom after the necessary tools and items of material have been added.

All trays and compartment sections are available from the side in this design. A ladder rack is provided and large tools may be placed in the space between the compartments (Figure 3). If an overhead tool rack is desired, and many companies prefer this feature, an arrangement similar to the one shown in Figure 4 is available.

A drop wire reel can be added to the body mounted either on the bed of the pick-up body or on the rear of one of the side compartment bodies.

A more elaborate design suitable for larger exchanges is illustrated in Figure 5. The same type of car is utilized, but the pick-up body has been removed and the compartment body mounted directly on the chassis. This type of body has the obvious advantage of carrying all needed material and tools and storing each item in its proper place. This makes for good housekeeping, and results in a neat and orderly arrangement of the materials and tools, which in turn makes for efficiency in handling the equipment and minimizing damage to delicate items of material.

Fig. 6. Open side view of light service body (Courtesy of York-Hoover Corp.).

An open side view in Figure 6 illustrates the effective use of trays in another make of maintenance car body to achieve a compact storing arrangement for small items and the use of sliding trays for storing types of subsets. Figure 7 shows a rear view of the car, and Figure 8 gives the general layout of the compartment body and side mounting supports for the ladder. Optional equipment such as an overhead ladder rack and towing hook can be provided.

A different body design is illustrated in Figures 9 and 10. In this construction, the compartment sections and trays are all accessible from one side only, the ladder and tool rack being mounted on the other side. The trays run the full width across the front end of the compartment body. This arrangement is well liked by many telephone companies.

Plenty of room is provided in the body for heavy tools and large items of material. An overhead rack for ladders and long-handled tools is available for this design.

Equipment and Material Carried On Exchange Service Cars

AS a guide to companies planning to improve their compartment arrangements, the following lists subsets and items of material that would ordinarily be carried on a maintenance car:

Subset Items—
- 2 desk stands (common battery)
- 2 bell boxes boxes (common battery)
- 2 handsets (self-contained type)
- 2 magneto wall sets
- 4 directories
- 3 desk stand receivers
- 3 transmitters
- 2 magneto wall sets
- 3 main cords
- 3 receiver cords
- 6 to 10 dry cells
- Assortment of mounting accessories; screws, nails, toggle bolts, and expansion screws:

Wire and miscellaneous hardware—
- 500 feet parallel drop wire
- 200 feet duplex inside wire
- 200 feet triplex inside wire

Fig. 5. Rural maintenance and installation car for larger exchanges (Courtesy of American Coach & Body Co.).

Fig. 2. Simple compartment body design for maintenance cars in small exchanges (Courtesy of American Coach & Body Co.).

Fig. 9. Open view of another type of maintenance and installation body (Courtesy of Highway Trailer Co.).

Fig. 10. Left side view of maintenance and installation body showing ladder support construction (Courtesy of Highway Trailer Co.).

1 hand coil of .104 copper wire
1 hand coil of .109 iron wire
1 hand coil of No. 18 ga. bridle wire
12 wood brackets
12 exchange insulators
6 toll insulators
30-penny spikes
50-penny spikes
Test clamps
Drive or screw type bridle rings
Drop wire items—drop clamps, drop clips, corner brackets, knobs, bolts, span clamps, etc.

Tools—

1—24' extension ladder
1—4' step ladder
1—9' digging shovel
1—tree trimmer
1—digging spool
1—pole tamp
1—hand axe
1—Coffing hoist of suitable size
1—lineman's wrench
1—pole climbers
1—corner brace and set of bits
2—pairs of slack blocks
1—striking hammer
1—claw hammer
1—magneto test set
1—common battery test set

The foregoing list should not be regarded as being wholly complete. Only such items should be carried that can be used much of the time. Experience will indicate which are the most essential items. One thing to remember in this connection is that certain items of equipment are easily damaged if carried too long on a maintenance car. Subsets can become dirty and worn in places; dry cells may become worthless; and car vibration is particularly hard on transmitters. A good rule to follow is not to carry any more of the more delicate or short-lived equipment than will suffice for two or three trips at the most.

Fig. 4. Showing tool and ladder rack arrangement on one type of maintenance car.

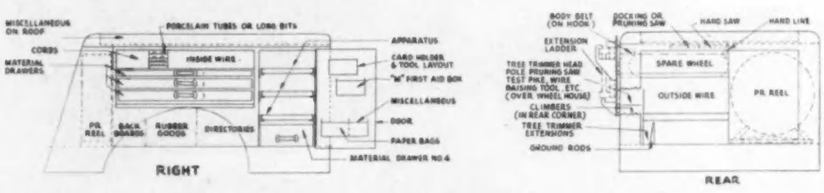


Fig. 8. General layout of compartment body and ladder rack on light service body (Courtesy of York-Hoover Corporation.)

Conclusion:

THE present war emergency has severely limited the opportunity for telephone organizations to acquire new maintenance cars. Before a new car can be purchased, approval must be obtained from the Office of Defense Transportation and the company must furnish proof of its actual need for the car. Used ½-ton pick-up cars may occasionally be purchased on the open market without priority.

When a new or a used car has been purchased, the next step is to obtain the compartment body. There are a number of firms that make car bodies. If the telephone company has sufficiently high priority and the manufacturer has the material on hand, it will be possible for him to fill the order.

In view of the difficulty of obtaining replacement cars, it is important

(Please turn to page 51)

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MANAGEMENT
AND
TRAFFIC

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USITA

Issues Traffic Circular

Circular No. 2 (Traffic)

Subject: Meeting Wartime Traffic Loads in Local Manual Offices

Traffic problems during Wartime is one of YOUR problems. This Circular No. 2 of the United States Independent Telephone Association prepared by its Engineer B. C. Burden will aid you. Its preparation includes the ideas of many minds and is the result of actual experience.

General

THE greatly increased message load and the high force turnover which exists in many exchanges has created a real problem for traffic people. To meet this problem, it is highly important that existing force and equipment facilities be utilized at maximum effectiveness.

This circular discusses ways and means of meeting the greatly augmented local traffic loads in manual offices with a minimum slump in service standards. If everything practical is done to work available force and equipment at maximum efficiency and service is still far below standard, consideration should be given to applying to the Communications Division for permission to add facilities necessary to restore service to a satisfactory level.

Obtaining Maximum Efficiency From the Operating Force

BECAUSE of a wartime trend toward abnormally high peak traffic loads at various hours of the day and evening, a closer check of operating conditions than would normally be required is necessary if speed of answer is to be maintained at reasonably good standards. The following points are of particular importance:

1.—Frequent observations of traffic and force distribution should be made.

2.—Speed of answer data should be carefully analyzed and should be obtained both in normal hours and in the busy hours. Effort should, of course, be made to have the speed of service uniform, keeping to a minimum the answers over ten seconds.

3.—The supervisor should be on the alert for poor cooperation (teamwork) between operators. As, for example, failure to pass cords and answer signals in adjacent positions.

4.—Operator seating arrangement should be studied with a view to keeping the most experienced operators properly distributed along the board.

5.—Assign the most experienced operators so they will be on duty during peak traffic periods.

6.—Supervise to insure that signals are answered in order of appearance during peak periods.

7.—Instruct operators to answer signals in the direction of busy panels in order to clear up congested conditions that might make it difficult to determine the order of appearance of signals.

8.—Signals appearing in vacant positions should be given preference to prevent pile ups.

9.—Vacation periods should be judiciously handled to make best use of the experienced operators.

10.—If a number of offices are involved and where force turnover is high, transfer experienced operators between offices if necessary to keep each office well seeded with experienced operators.

11.—Check speed of answer data to insure that signals are being answered in order of appearance.

12.—Utilize short cuts to save operator's time such as:

(a)—Use one number tickets on 5c and 10c calls and omit timing during peak periods.

(b)—Temporarily discontinue practice of following up uncompleted A-B toll calls.

(c)—Discontinue practice of showing on tickets the individual coins deposited during peak periods.

Obtaining Maximum Efficiency From Existing C.O. Facilities

UNUSUAL heavy wartime traffic loads have resulted in trunking equipment in many offices carrying

peak traffic greatly in excess of that for which the facilities were originally designed. In situations where the increased load has resulted in a virtual breakdown of service, the only practical remedy is promptly to ask the Communications Division of the WPB for authority to purchase and install additional trunking equipment.

If the increased traffic load has merely lowered the normal service standards and particularly if the added load is of a temporary wartime character, every effort should be exerted to get the maximum efficiency out of the existing equipment so as to avoid the necessity for purchasing and installing additional trunking equipment which might not be needed after the war.

In this direction, some of the factors which must be considered in obtaining maximum utilization of equipment are:

1.—Judiciously assign subscribers lines so that lines representing different classes of service and with different busy hour calling rates are placed in the same panel so that the traffic load is more evenly distributed among operators.

2.—Study the loading of end sections and positions to insure that a fair share of the load is being handled but that they are not overloaded.

3.—Make sure that PBX subscriber lines and other similar lines with high calling rates are properly spread throughout the switchboard.

4.—Panels having the least number of subscriber answering jacks should be assigned the busier lines.

5.—Busy subscriber lines such as PBX trunks should not be assigned to adjacent jacks because of the difficulty in handling cords and in observing line signals.

6.—Make periodic plug counts to determine shifts necessary for load adjustment purposes.

7.—Supervisors should be instructed to observe and report to the **Chief Operator** all cases of under or overloading of busy panels and busy lines.

8.—Careful observation should be made of the adequacy of outgoing trunks.

9.—Divorce from the switchboard all work which could be done at intercept or information tables or desks.

10.—In offices having boards of the single answering jack type, the position load can be partially equalized by multiplying high calling rate lines to spare answering jacks, using colored lamp caps to indicate the second appearance.

11.—Add cord circuits, where possible, in positions in which holding time is sufficiently high as to make additional cords desirable.

12.—Provide for better teamwork in cord passing by increasing the length of the end cords where necessary.

13.—Check the possibility of transferring A board toll traffic from the local to the toll board where facilities are available at the toll board and where traffic loading will permit.

14.—It should be recognized that where there is a substantial turnover in force and where the experience factor is low, it will be desirable to increase the switchboard supervision. Under normal conditions 8% supervision is probably satisfactory. When a low experience condition exists, supervision should probably be increased to 15%. In other words, inexperience requires more and better supervision.

B. C. BURDEN,
Engineer

Company Holds 3-Day Meeting of Managers

District managers of Central Electric and Telephone Company properties in nine states assembled at Sioux Falls, S. Dak., during March for a three-day conference, devoted primarily to a detailed study of wartime problems and post war plans of the company.

Executives of 200 telephone companies, 63 electric properties, and gas companies there and at Columbus, Neb., were attending the conference, coming from Wisconsin, Illinois, Iowa, North Dakota, South Dakota, Minnesota, Nebraska, North Carolina and Virginia.

The conference was the first held since February, 1941, and was scheduled for discussion of problems of keeping services at a high level in the face of wartime restrictions, R. A. Phillips, vice president and general manager, said.

An effort is also being made to coordinate postwar thinking, especially in terms of new construction and restoration of existing facilities, he said.

Following a dinner meeting, safety awards were presented to managers of the Hot Springs, S. D., and Columbus, Neb., districts where no accidents of any type were reported in the past year. Attending the conference were A. B. Clark, auditor of the La Crosse, Wis., district; V. B. Clark, manager of the Pekin, Ill., district; Toral Duckett, manager of the Le Mars, Ia., district; Clark Deane, manager of the Sioux Falls gas district; C. O. Field, manager of the Devils Lake, N. D., district; Harry Hagen, manager of the Hit Springs, S. D., district; W. C. Martin, manager of the Park Ridge, Ill., district.

T. J. Newman, manager of the New London, Ia., district; E. B. Samp, manager of the La Crosse, Wis., district; W. H. Schrupp, manager of the Slayton, Minn., district; H. R. Slocum, manager of the Columbus, Neb., district; W. E. Sparger, manager of the Mt. Airy, N. C., district; C. R. Thompson, manager of the Sioux City, Ia., district; L. P. Ulrich, Woonsocket, S. D., manager of the South Dakota electric district; Martin Wandrey, plant superintendent at La Crosse, Wis., and C. C. Ward, Charlottesville, Va., manager of the Virginia-West Virginia district.

Telephone Company Sale is Approved

Sale of Lebanon and Richland exchanges of the Missouri Standard Telephone Company to the United Telephone Company was approved during March by the Public Service Commission, according to John O. Tidd, manager of the two offices. The reported sale price was $105,000.

In its application to the PSC, The United Telephone Company said that present rates would be continued. Only change in personnel will be in the Lebanon office. Mrs. C. B. Morton, cashier and wife of the former exchange manager, will join Mr. Morton. Archie Noe is local manager of the Richland office.

If Your Magazine Is Late — Please Be Patient—The Mails Are Slow Now!

THE Observation Tower

If you have observations or even a friendly bit of argument suitable for use in this column, you are invited to send them along, which automatically makes you a member of the Gang. You will be anonymous—no names of telephone people or telephone companies are used in the column. Address "The Observer", in care of TELEPHONE ENGINEER AND MANAGEMENT.

Cash and Taxes:

A TELEPHONE man says he has heard that Independent telephone companies had more cash on hand at the end of 1943 than ever before. He thinks that if this is true, it must add up to something.

Well, it's certainly true as to many companies, but one thing it adds up to is that most companies also owed a lot more taxes at the end of last year than they ever owed before.

We put one of our statistical hounds on this job, and after snooping around a bit he says that, according to the statistics gathered annually by the United States Independent Telephone Association, the Class A and Class B Independent companies all together had on hand at the end of 1939 cash and temporary investments (such as government bonds) of about $14,400,000 and had accrued and unpaid taxes of about $5,800,000. At the end of 1942 they had on hand about $19,200,000 and owed taxes of about $19,300,000.

He thinks that when statistics for the 1943 year-end are available they'll show a lot more cash on hand—and a lot more taxes owed.

What all this means we don't pretend to know. But if we were running a very small telephone company, we think we would try to get to a point where we could lay by every year the cash we needed to pay our taxes for that year.

When is a Telephone Company "Small"?

SPEAKING of small telephone companies, we've often wondered just how small a company must be to be "small". So we set out to find out.

We find that the Bureau of Foreign and Domestic Commerce of the U. S. Department of Commerce has classified telephone companies as "small" when their annual revenue is less than $10,000. In its census of business establishments for the year 1939, the Bureau found that there were 6,694 telephone companies in the country, and that 5,848, or 87.4% of them, were "small".

Incidentally, the Bureau reported that in 1939, there were 5,969,000 farms in the United States. So there's still room for a few more farm telephones.

What's Your Hobby?

A GANG member wants to know (for no sensible reason that we can think of) what kind of hobbies or avocations telephone men—and women—have.

The Observer and his Gang usually know all, hear all, see all. But this proposition has got us stumped.

We've found one telephone man who is a Shakespearian scholar in off hours, and another who keeps bees. We also heard of one who tootled a slip-horn for recreation until the neighbors threatened to have him thrown in the klink. But that's as far as we've been able to go to date.

We've put our principal spy, X-41, on the job. Meanwhile, have you got a curious hobby, or do you know of any telephone man or woman who has?

Capital Investment Per Worker

PEACETIME jobs for all who can and need to work are going to be mighty important to the country's prosperity after the war.

Some folks are likely to overlook the fact that in a country as highly industrialized as the United States, somebody has to invest and therefore risk money to make jobs for people.

Dr. Emerson P. Schmidt, economist of the Committee on Economic Policy of U. S. Chamber of Commerce, has estimated the average investment per worker in the manufacturing business is $6,300; in the chemical business,

about $17,000; in railroads, about $25,000, and so on.

We do not have comparable figures for Independent telephone companies, and of course the investment per worker at telephone exchanges varies with the size and type of the exchange. One of our statistical snoopers made some quick figures and he guesses that it would be around or above $14,000 a worker for plant investment alone in the Independent telephone business.

Has anybody got the dope on this question? We'd like to have it for publication.

Whose Remarks?

STOP reading if you've heard this one: A construction foreman called up his plant superintendent and said: "I'm filling in an accident blank about one of the grunts dropping a crowbar on Mike Casey's foot. There's a space on the blanks for 'Remarks'. Whose remarks do you want —mine or Casey's?"

General Telephone Corp. Purchases Pike County (Ill.) Telephone Co.

The General Telephone Corporation has purchased all of the outstanding stock of the Pike County Telephone Company, Pittsfield, Illinois, as of March 31. The Pike County Telephone Company operates in Pike and Calhoun Counties in southwestern Illinois. It serves 3,520 telephones through 16 exchanges. Of these 16 exchanges, 3 are common battery, 6 magneto and 7 unattended dial. The property was operated for many years by the late Ed Glandon and since his death has been operated by Mrs. Glandon who has sold her entire interest.

Officers elected at the March 31 stockholders' meeting are: president, C. R. Brown; vice presidents, Walter Dakin and L. F. Shepherd; secretary and treasurer, E. M. Hiestand; assistant secretary, C. M. Doll; assistant treasurer, M. H. Burns, and auditor, A. G. Kiesling.

Directors elected are: C. R. Brown, Springfield, Ill.; J. F. O'Connell, Walter Dakin, L. F. Shepherd and A. D. Stevens. The latter is council for the Illinois companies of the General Telephone Corporation in Illinois. All of the directors are well known in the Independent telephone industry.

CONTINUED GOOD SERVICE

(Editors Note—This editorial clipped from the March 23 issue of the Tampa, Fla. Morning Tribune is well merited praise. We are reprinting it for your information—RWS)

Carl D. Brorein, President, Peninsular Telephone Company

The city is to be congratulated on the assurance of the continued operation of the Peninsular Telephone Company through the extension of its franchise, as approved in a special election Tuesday. The election, while only a formality, was a legal requirement for granting a new franchise, which will run for 30 years.

Despite the increasing and perplexing difficulties of wartime restrictions, shortages of material and equipment, plus an unprecedented demand for telephone communication, the Peninsular Company has carried on with commendable efficiency through the emergency. Its record prior to the war period was one of constantly improving and extending its facilities to meet the needs of a growing community. Its officials, headed by that sterling citizen, Carl D. Brorein, president, and all its employees have been actuated by a true conception of public service. Founded 43 years ago by the late lamented William G. Brorein, the Peninsular soon became an established institution and one which has fully merited the goodwill and patronage it has generously received.

Rules for Overhead Line Construction Modified

General Order 115 has been modified by the Illinois Commerce Commission in accordance with a petition of the Illinois Bell Telephone Company and intervening petition of The Illinois Telephone Association, by its General Counsel, Ben B. Boynton. The order of the Commission, dated March 21, provides "that the Illinois Bell Telephone Company, petitioner herein, and all telephone companies for whom Illinois Telephone Association intervened, and any other telephone companies, communication companies, or any other wire-using companies with respect to communication circuits be, and the same are hereby, authorized to depart from the requirements of General Order 115 to the extent and in the manner set forth below:

1. Rule 120.11. To reduce from 18 feet to 15 feet the vertical clearance above ground of communication conductors, wires, cables, messengers and guys across or along alleys.
2. Rule 120.47 and 120.65. To omit the placing of guard arms, or in lieu thereof other substantial insulating conduit, on poles.
3. Rule 120.65. To place messengers carrying communication conductors or cables on either the field or street side of poles.

It is further ordered that nothing contained in this order with reference to authorization or permission to deviate from General Order 115 shall be construed as in any way changing the requirements of the General Order as to vertical clearances of communication wires and cables above railroad tracks."

New Secretary of Telephone Company

Russell S. Jones of Greenfield, Ind., formerly associated with the Union Telephone Company at Greenfield, has been employed as secretary-treasurer with the Illinois Central Telephone Company at Clinton, succeeding Don Walker who resigned. He took over his new duties April 1.

Highlights of the Communications News

Important Communications developments of the past month, briefed for busy readers

by

ROLAND C. DAVIES
Editor, Telecommunications Reports

Draft Deferments

PRACTICALLY no likelihood of sanction for the deferments of men in the telephone and other branches of the communications industry in the 18 to 26 age group for companies within the boundaries of the continental United States was viewed as the result of the deliberations of the Inter-Agency Committee on Occupational Deferments. The only deferments for military service of men of that age category would come, it was understood, for communications workers of the international cable and radiotelegraph companies who are now at overseas posts and whose work may be important in present and future military operations.

This was apparent after the Board of War Communications through FCC Commissioner E. K. Jett in his capacity as chairman of the BWC Coordinating Committee had presented the Committee with a survey and statistics dealing with the need for deferment of critical workers in the domestic and international communications field. The Board of War Communications was granted the status of a "Claimant Agency" before the Inter-Agency Committee.

The Inter-Agency Committee was felt to view that every employee below 26 no matter his skills, knowledge or educational qualifications was NOT irreplaceable. In fact, Major General Hershey, National Selective Service System Director, was declared to have made the statement that a worker under 26 years of age would have to be "an Einstein" to receive a deferment. Between the ages of 26 and 30, the Selective Service System is understood to view that applicants for deferment to win such an authorization must be fully justified as irreplaceable. Above 30 years of age any deferments must be employees in a listed critical occupation in essential industries.

For the telephone industry, together with all other branches of communications and other industries, immediate consideration should be given to all employees below 31 years of age because the National Selective Service System headquarters has definitely indicated that this age group will be next scrutinized with the same thoroughness as the present situation with regard to those below 26 years old. In regard to the men below 26 there is a chance that certain categories of critical occupations may be considered for deferment—the decision of the Inter-Agency Committee to grant such a right to some 2,800 railroad freight handling employees as irreplaceables was felt to have an anology in domestic communications.

The advice of the governmental authorities in Washington was that telephone companies must inaugurate, if they have not already started them, intensive training programs of personnel for these critical occupations to keep the service going. The Bell System has already foreseen the situation and is felt to be prepared to meet the emergency.

A large number of Independent telephone companies, big and little, has flooded War Manpower Commission Chairman McNutt with telegrams and letters relating their respective critical situations if all deferments under 26 years of age are terminated. However, the Inter-Agency Committee is believed to be adamant against these appeals and very few deferments are likely to be granted for such workers.

The Inter-Agency Committee in its session April 11 was scheduled to formulate its regulations for the categories of employees by specific companies and war production plants which would be eligible for deferment as irreplaceable.

It was definitely indicated that the deferment treatment of men in the 18 to 26 year old brackets will be "very drastic" not only for the communications industry, both operating and manufacturing, but for all other industries as well. The likelihood was deemed quite certain that for the telephone manufacturing industry, the cases of essential workers under 26 years old would have to be most conclusively proven before deferments would be granted.

All deferments of workers below 26 have to be submitted on a special deferment blank (DSS Form 42-A, Green) with the local draft boards and all such deferments are referred to the state Selective Service organizations for approval.

Commissioner Jett told the Inter-Agency Committee that out of a total employment of 408,837 in both domestic and international communications companies, 82,869 workers, or 20.3% were in critical occupations. However, of the total critical workers, only 2,214 were between the ages of 18 and 26.

Mr. Jett emphasized the fact that in the international communications industry—vital to the successful prosecution of the war effort—only 517 men in the age group 18-38 were in

AT THE KENTUCKY CONVENTION.

Conventioneers seen in "7th Inning Stretch" during strenuous one day session at Lexington, April 5

critical occupations, and of these, only 47 were in the 18-26 age brackets. In the domestic communications field, only 2,617 men between 18 and 26 were in critical occupations, he said.

International

IN the international communications field, "the loss of any man will have serious effects," Commissioner Jett said. He stated that "the BWC urges that deferments of all men in critical occupations in the international as well as in the domestic communications industry be considered entirely on the basis of the work each man performs *** the Board feels most strongly that this procedure will yield results most favorable for the prosecution of the war." Commissioner Jett stated that the BWC "urges most strongly" that whatever consideration is given to men under 26 should NOT weaken the protection for men over 26 "in these critical occupations." The older age group in the technical branches of the industry, "in an absolute sense *** are irreplaceable," Commissioner Jett stated.

Support for this position "has been made clear recently" by high military and naval officers, including Brigadier General Frank E. Stoner, on behalf of the Chief Signal Officer; Navy Secretary Frank Knox; and the Senate Committee on Interstate Commerce, Mr. Jett said. Dallas Smythe, FCC Chief Economist gathered and compiled the statistics presented to the Inter-Agency Committee.

Commissioner Jett enumerated the following considerations for the Inter-Agency Committee's attention: increased activity on the war fronts will place a greater strain on international communications; every man on the job and more will be required to handle the traffic; there will be no "cutbacks" in this industry; the classification "critical occupation" indicates a training period of at least two years to develop necessary skill, but in the communications industry the training period is even longer (3 to 5 years for testing and regulating personnel).

Domestic

DISCUSSING domestic communications, Commissioner Jett stated "the reasons I have given for granting deferments to men in critical occupations in international carriers, are equally important in the case of domestic communications." He pointed out that there are 336 men less than 22 years of age in critical occupations in the landline wire common carriers, and "although small in number, their service is of great importance."

Mr. Jett stated that he felt that it was "a moderate request" to ask consideration for these men, "in view of the fact that the total employment in this branch of the industry exceeds 400,000." He stressed that "in any event it will be urgent" that occupational deferments be given to 1,832 men in critical occupations within the age group 22-25.

Mr. Jett said that the American Telephone and Telegraph Co., describing the situation of males 18-26 in the critical occupations, gave the following viewpoints:

"Over two-thirds of the deferments which are now required in this group are to be found in those companies where the impact of the war is the greatest, i. e., Chesapeake and Potomac, Southern Bell, Michigan Bell and Pacific Telephone and Telegraph Company. Further, the geographical spread of operation and consequent necessity to be able to meet telephone demands in all communities, large and small, would affect the ability of all the telephone companies to release individual employees in particular locations. In addition, some of the companies have a small number of highly skilled specialists involved in maintenance and operation of radio telephone equipment.

"Rather than a complete exclusion of employees in critical occupations within any particular age group, it would appear that the total situation would best be met by a consideration of each employee's need in the particular location."

Independents

DUE to the lack of time, Commissioner Jett told the Committee that figures were not available for the 6400 Independent telephone companies. The FCC Commissioner had discussed the subject with Clyde S. Bailey, executive vice-president of the United States Independent Telephone Association, and the latter had reported that "'because of the large number of units in the Independent field, it is impossible to present figures showing a breakdown of employ by occupational classification."

Mr. Bailey in his statement to Commissioner Jett stressed his belief that "as a result of the operation of the draft system and of a weaning away of many of our employees by higher paying positions in shipyards and defense plants, our companies are down to bedrock. From reports which come into our Association from time to time, the conclusion is irresistible that it is imperative that nothing be done to deplete our ranks further." Mr. Bailey also brought out that maintenance of telephone properties is running heavier than before the war so the need of qualified men for this work was much greater. He added that "we are definitely afraid that if telephone companies are to be

(Please turn to page 56)

Convention Dates

Illinois Telephone Association, Edgewater Beach Hotel, Chicago, April 18 and 19.

Spring Executive Conference, United States Independent Telephone Association, Edgewater Beach Hotel, Chicago, April 20 and 21.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 25 and 26.

Indiana Telephone Association, Serverin Hotel, Indianapolis, May 3 and 4.

Wisconsin State Telephone Association, Park Hotel, Madison, May 10 and 11.

Pennsylvania Independent Telephone Association, Berkshire Hotel, Reading, May 17 and 18.

New York State Telephone Association, Hotel Syracuse, Syracuse, May 24 and 25.

Washington and Oregon Independent Telephone Associations, joint convention, Columbia Gorge Hotel, Hood River, June 23 and 24.

United States Independent Telephone Association, Stevens Hotel, Chicago, October 10, 11 and 12.

Missouri Telephone Association, Place not decided, November 21 and 22.

A QUESTION!

By an Independent Telephone Pioneer

Dalhart in northwestern Texas is closer by air line distance to six other state capitals than to Austin, Texas. Can you name the states?

(For answer turn to page 60)

Telephone Engineer's TRAINING COURSE

☆

ELECTRICAL FUNDAMENTALS FOR THE TELEPHONE MAN

☆

Part XI---Basic D.C. Movements

General

A THOROUGH knowledge of the theory and application of electrical testing instruments is a valuable asset to anyone engaged in electrical work.

Electricity being a colorless, weightless, and invisible medium, it is highly essential that we be able to detect its presence and measure its characteristics, otherwise we will be unable to efficiently control it to do our work and light our homes.

At first thought it would seem that the subject of electrical testing instruments is a rather simple one on which to spend much time, as most anyone engaged in electrical work is familiar with the fact that a voltmeter measures volts, an ammeter measures amperes, and an ohmmeter ohms. However, a great deal more knowledge is required to intelligently use and interpret the readings obtained with electrical testing instruments than merely knowing how to connect an instrument in a circuit and being able to read the needle deflection. This point is illustrated by the following discussion of typical errors that may result from failure to understand testing instruments.

Common Testing Errors

ONE of the most common errors which those unskilled in the use of testing instruments make is failure to take into account the effect of the voltmeter resistance on the measurement obtained. In dealing with high impedance voltage sources such as are typical of the radio and communication field, the reading obtained on a voltmeter connected across the source may be considerably lower than the true voltage. This is due to the internal voltage drop which takes place across the source impedance due to the current required to operate the voltmeter. Unless taken into account, this error may result in a person concluding that the voltage source is operating improperly where as it may be in perfect condition.

Effect of Low Resistance Voltmeter

THIS type of error is illustrated schematically by Figure 1. This figure shows how measurements taken across the 60 volt high impedance potential source will vary when two voltmeters of different characteristics are used to measure the output voltage. For example, suppose a voltmeter of the low resistance type (10,000 ohms) is placed across the 60 volt source. the voltmeter will show only 50 volts reading. However, if a high resistance voltmeter (500,000 ohms) is used it will give a reading of approximately 59.76 volts, or within 0.24 volts of the correct value. From this it can

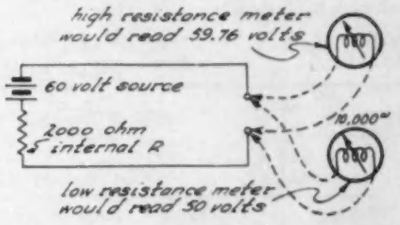

high resistance meter would read 59.76 volts
60 volt source
2000 ohm internal R
10,000Ω
low resistance meter would read 50 volts

Fig. 1.—Error Due to Use of Low Resistance Voltmeter on a High Resistance Source.

be seen that the high resistance voltmeter can be expected to give approximately a true reading on a high impedance voltage source, whereas a low resistance meter will give a reading that may be greatly in error. The moral, therefore, is to understand the characteristics of both the source under measurement and the instrument used in order to avoid misleading conclusions from the readings obtained.

Another source of error is the use of low frequency A.C. instruments on alternating current circuits whose frequencies are outside the operating range of the instrument used. The ordinary voltmeters and ammeters used in connection with 60 cycle power circuits are useful only over a range of frequencies extending from approximately 20 to 133 cycles. When used on frequencies higher than 133 cycles they will give little or no reading.

Error Due to Incorrect Connection

STILL another source of error is the incorrect connection of an instrument in the circuit to be tested. For example, if a voltmeter is connected in series with the circuit (see Figure 2) incorrect readings will result inasmuch as the load current must pass through the relatively high resistance meter, hence very little current reaches the load and almost the entire voltage of the circuit will appear across the voltmeter. If low resistance instruments such as ammeters and milliammeters are connected in

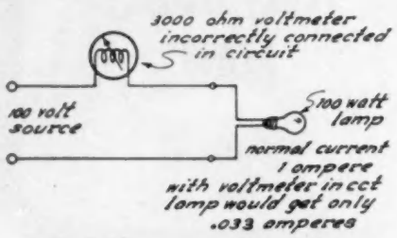


Fig. 2—Effect of Connecting a Voltmeter in Series with the Load.

the wrong part of the circuit, they may be burned out or at the very least severely damaged., because ammeters and milliammeters must always be connected in series with the circuit. These typical errors of both, the theory and practical application of electrical testing instruments is needed by those working in the electrical or electronic fields.

Classification of Measurements

BEFORE considering the theory and specific application of the many types of electrical testing instruments, a study should be made of the classification into which various electrical measurements fall.

Measurements on electrical circuits may be divided into two principal groups; i.e.,

1. Direct current measurements
2. Alternating current measurements

The following table summarizes the various types of measurements ordinarily made in connection with power, telephone, or radio work and according to the group into which the measurement belongs.

Classification of A.C. Measurements

DUE to the fact that a specific type of A.C. instrument is suitable for use only over a limited frequency range, it is necessary to separate alternating current measurements into five classes according to the frequency of the source being measured. These five classes are classified as shown in table No. 2. (See page 62).

The most common type of measurement in the alternating current range is the low frequency class, that is 60 cycles. This is due to the fact that most commercial power is furnished at this frequency, hence our motors, radios, lights, etc. all consume power at 60 cycles.

In the voice frequency range we are concerned with transmission measurements in telephone communication systems, public address work, etc. Carrier frequency measurements are necessary in the maintenance of carrier telephone systems used by the large communication companies. Also in connection with the carrier systems which operate on frequencies as high as 100,000 cycles over the high voltage power lines. Radio frequency measurements of course are necessary in the maintenance of radio transmitters and receivers and ultra-high frequency measurements are virtually the same as radio frequency measurements, however, they require a somewhat different type of measuring instrument because of the high frequencies involved.

Simple Direct Current Instruments

THE essential difference between most alternating current and direct current instruments is that direct current instruments are magnetically polarized. This means that a permanent magnet is used to polarize the coils or moving elements of the meter. A meter which is polarized can be used only on currents which flow in one direction. Alternating current instruments on the other hand are not magnetically polarized, hence even though the current reverses rapidly in the meter the moving element will continue to deflect in the same direction.

Direct current instruments are inherently more sensitive than alternating current instruments, hence D.C. meters are often used in conjunction with copper oxide rectifiers which convert alternating current into direct current which then can be measured on the direct current instrument. This will be explained in detail later.

Most electrical testing instruments are current operated devices, that is, it is the effect of the current flowing through the instrument winding that brings about an indication showing

(Please turn to page 62)

Direct Current Measurements

Type of Measurement	Unit of Measurement	Measuring Instrument
Voltage	Kilovolts, volts or millivolts	Voltmeter or millivoltmeter
Current	Amperes, milliamperes or microamperes	Ammeter, milliammeter or microammeter
Power	Kilowatts, watts or milliwatts	Wattmeter or watthour meter
Resistance	Megohms or ohms	Ohmmeter or Wheatstone Bridge
Alternating Current Measurements		
Voltage	Kilovolts, volts or millivolts	Voltmeter or millivoltmeter
Current	Amperes, milliamperes or microamperes	Ammeter, milliammeter or microammeter
Power	Kilowatts, watts or milliwatts	Watthour meter or wattmeter
Resistance (effective)	Ohms	Impedance Bridge
Reactance (inductive)	Ohms	Impedance Bridge
Reactance (capacitative)	Ohms	Impedance Bridge
Inductance	Henries, millihenries, microhenries	Impedance Bridge
Capacity	Microfarads, micro-microfarads	Capacity Bridge
Frequency	Kilocycles or cycles	Frequency Meter

Table No. 1 — Types of Measurements, Units, and Instruments

Chief Signal Officer Inspects Pacific Theatres of War

U. S. Signal Corps Photo
Maj. Gen. Harry C. Ingles, Chief Signal Officer

NO shortages of critical items of communications and radio equipment have occurred in the Pacific theatres of war, Major General H. C. Ingles, Chief Signal Officer of the Army, reported upon his return to the War Department after a five weeks' inspection of the Central Pacific, Southwest Pacific and South Pacific areas' signal installations.

All three high commanders in those theatres—Admirals Nimitz and Halsey and General MacArthur—stated to the Chief Signal Officer that they never had been delayed in their operations by the lack of signal apparatus and facilities.

General Ingles paid the highest tribute to the Signal Corps troops in those theatres of war because of their displaying of the greatest ingenuity in their work of installing and operating communications, both radio and wire, under the most difficult conditions of jungle warfare. With all these difficulties the American soldiers preserve their humor and put up signs over their communications shacks reminiscent of the telephone and telegraph companies for which they worked back home.

The enormous distances of the Pacific theatres where a couple of thousand miles are just a normal distance throws a great burden on communications, General Ingles stated. He emphasized to the newspapermen that he should not be regarded as an authority on the Pacific war zones as he had only spent 5 weeks there.

Declaring that in the other theatres of operations such as Europe, Africa, Mediterranean and Caribbean the primary communications medium is wire with radio regarded as auxiliary but valuable, General Ingles pointed out that in the Pacific theatres radio is not only the primary means but in most cases the only method of communications because of the huge spaces of water. This throws a great burden on the radio systems of the armed services, he noted.

Procurement Satisfactory

IN discussing the procurement problems of the Signal Corps, General Ingles brought out that the Corps' procurement and distribution now is quite satisfactory and that this phase of its activities had come up in improvement a great deal, by over 75 percent, during the past year. He told the newspapermen that the Signal Corps procures 96,000 different items of communications equipment, including a great many parts.

Relating that the jungles in the Solomons and New Guinea were the worst that he had ever seen—much more difficult than those of Central and South America—the Chief Signal Officer described how the jungle affects both the operations and the equipment of the radio apparatus. The jungle has a blanketing effect on radio so that walkie-talkies don't transmit with their normal range, particularly if the jungle is wet, he said. Sets with normal range of five or ten miles can't get more than two or three miles, he noted. Therefore, the Signal Corps as soon as it is possible lays telephone wire networks on shore.

In Thick of Fighting

THE Signal Corps troops' ingenuity is remarkable, according to the Chief Signal Officer. The sergeants and enlisted men in their small "teams" or units often do not perform their installation and maintenance and repair operations according to the book but try out different methods of their own invention. He related that he had never seen so many different ways of putting up field wire and told about a young lieutenant at Bougainville who made cross-arms with little notches instead of the usual insulators and tied the wire into these notches with basket-weave knots in a very good method. He noted that the field wire which weighed 185 pounds per mile in World War I is lighter in this war, weighing 125 pounds.

The Signal Corps soldiers are combat troops, taking part in the fighting a great deal and engaging in all actions, General Ingles stressed. They are trained in this country in infantry methods because of their being right in the combat operations. He added that this applies to all service troops in this war and cited how the Army Engineers at Milne Bay left their bulldozers and took up their machine guns and rifles and mowed down an attack wave of Japanese. He also paid special tribute to the Signal Corps photographers who go with the Infantry in the first waves, although not armed.

Presents Painting to Chief Signal Officer

A combat painting depicting a wounded Signal Corps officer defending a wire laying team was presented recently to the Signal Corps by the General Cable Corporation after it had been reproduced on posters and widely distributed.

Major General H. C. Ingles, Chief Signal Officer, accepted the painting at an informal ceremony. It shows an episode in the North African campaign in which Lt. Robert Phillips was severely wounded during a bombing attack, losing his right arm. In spite of his wound, he drove a jeep to a first-aid station seeking help for other wounded men.

A Telephone Maintenance Car

(Continued from page 38)

that more than the usual amount of care be given to maintenance cars in present use. These cars should be frequently checked by automobile service organizations and the maintenance man should be made responsible for the proper care of the cars between inspections, particularly with reference to the condition of tires, brakes steering gears, and lights.

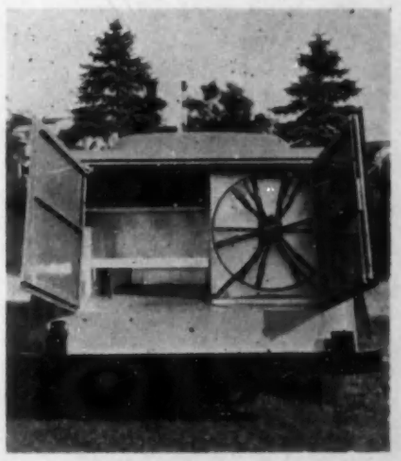


Fig. 7. Rear view of light service body (Courtesy of York-Hoover Corporation).

Personalities IN THE NEWS

C. William Rich, who was named secretary of the New York State Tel. Assn. last October, was recenly appointed executive assistant to the chairman of the Ways and Means Committee of the New York Assembly. He has resigned from the telephone association.

●

Don W. Walker, secretary-treasurer of the Illinois Central Telephone Company, has resigned his position to be secretary of the New York State Tel. Assn. He assumed charge of the association's new quarters at 2-A South Hawk St., Albany, on April 1.

●

Henry Middleman, who started working for the Monroe County Tel. Co., Sparta, Wisc., forty years ago, was honored at a dinner during March celebrating his 40-year service record. The company presented him with a gold watch while fellow employes demonstrated their esteem with the presentation of a War Bond.

●

Lee McCanne, vice president and assistant general manager of the Stromberg-Carlson Company, has just concluded a week of intensive speaking before business and sales groups. During late March he spoke before the American Industrial Development Council at the U. S. Chamber of Commerce. He also addressed groups in Kansas City and St. Louis.

●

M. C. Henrichsen, manager of the Gann Valley (S. D.) Tel. Co., has been busy for the past several months installing new poles and lines in preparation to install a new switchboard. Newspaper reports state that the switchboard is now in operation.

V. M. Galloway

V. M. Galloway who has been associated with the Inter-Mountain Telephone Company at Bristol, Va.-Tenn. for the past twenty-three years, has been promoted to manager of the Elizabethton, Tennessee exchange. **Mr. Galloway** was formerly in charge of Central Office Equipment at Bristol.

●

Cove L. Knipple, manager since 1933 of the Indiana Bell Tel. Co. at Kokomo, retired March 31, after serving 47 years with the company and its predecessors. On his retirement the company announced that **Max G. Lewis,** former manager at New Castle, Indiana, will succeed as manager at Kokomo.

●

J. M. Buttram has purchased the Sulphur Springs, Ark., telephone exchange from **William D. Schmidt** for a consideration of $2,000.00.

Elmer J. Chrisp has obtained permission of the Nebraska State Railway Commission to acquire the properties of the Madrid and Elsie Telephone Exchange and to establish rates for telephone service immediately.

●

Leon F. Roberts, commercial manager of the Jamestown (N. Y.) Tel. Co., and former mayor, has been selected master of ceremonies at the annual Jamestown Chamber of Commerce dinner the night of April 19, at which **Senator Alben Barkley** will be the principal speaker. **Mr. Roberts** is the author of the outstanding advertising the Jamestown company has been doing since wartime shortages of telephone facilities.

●

Arvid L. Koski, of Detroit, and **Theodore O. Hanson,** of Northport, both Michigan Bell Tel. Co. employes, will be awarded the Vail Medal for saving the lives of three persons, the medal committee announced recently.

●

Harry B. MacMeal, Chicago, one of the oldest Independent Pioneers in the manufacturing business and author of "The History of Independent Telephony", is as active as ever in the industry representing the Runzel Cord and Wire Co., of Chicago. **Harry** has been attending many of the conventions and is a living encyclopedia of Independent telephony.

●

B. C. Burden, engineer of the United States Independent Tel. Assn., Washington, is addressing several state telephone association conventions during this month. One of his engagements will be at the Nebraska convention where **Bernie** was transmission engi-

neer of the Lincoln (Nebr.) Tel. & Tel. Co.

•

Max Sheneman is the new manager of the King City, Mo., exchange of the United Tel. Co. He was transferred from Tipton, Mo., to succeed **Harry Vail,** who has been made manager of the California, Mo., exchange of the same company.

•

Russell Harper is now owner of the Quinlan (Okla.) Switchboard Exchange, having purchased the property from **Elie N. Chastel** who was seriously injured while working on a pole several months ago.

•

Stewart E. Wright, general sales manager of the National Telephone Supply Company, Cleveland, has recently been elected president of the Alumni Association of the Phi Kappa Psi Fraternity. There are many members of this famous fraternity in the utility field.

•

Captain Paul E. Griffith of the Army Signal Corps, who served as the first president of the National Federation of Telephone Workers up until the time that he entered the military service, is now stationed in England at the American School Civil Affairs Center handling communications and labor relations matters. **Captain Griffith** is now with the Civil Affairs of the Army and will be engaged in the operation of telephone systems whenever the Allied forces embark on their invasion of Western Europe.

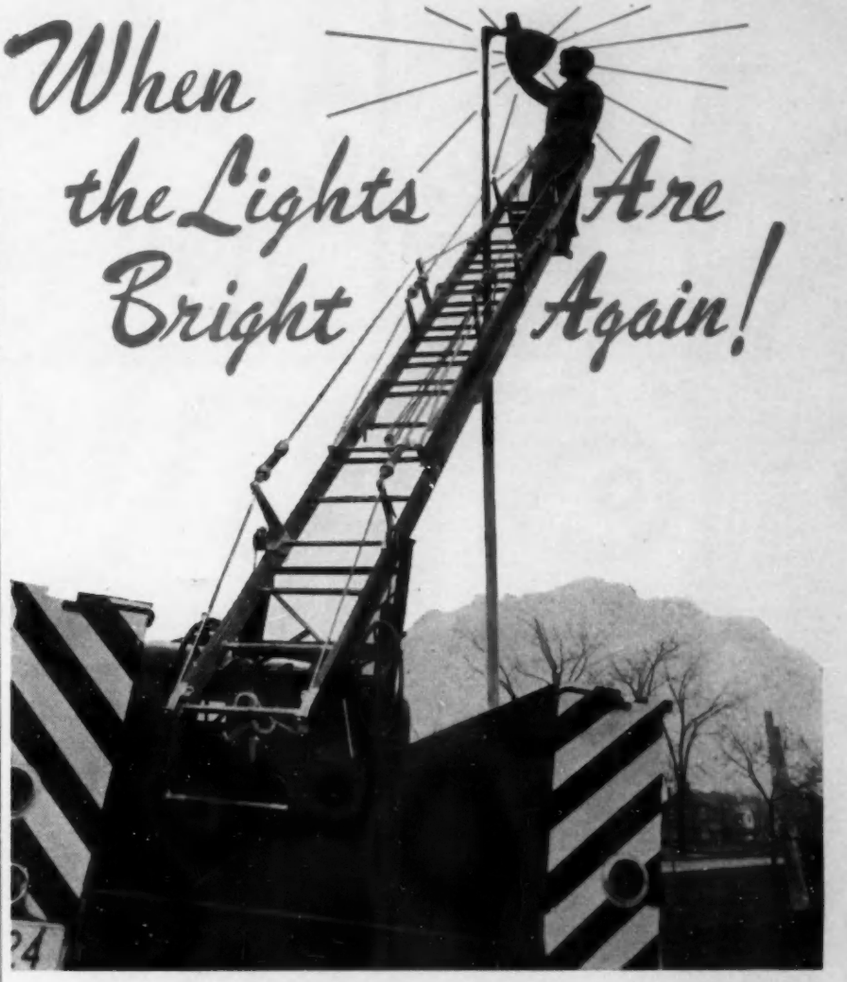
•

Philip L. Thomson, director of public relations of the Western Electric Company, retired under the company's pension plan on April 1, after forty-one years of service. He has been succeeded by **Fred B. Wright,** an executive of the company's nationwide distributing organization. **Mr. Thomson's** inventiveness established many "firsts". He conceived institutional advertising as a forum for manufacturers where the aims of industry could be presented to the public. With the advent of talking motion pictures in 1926, he produced the first industrial sound film.

•

Late Mail Delivery

is not unusual these days. Patience is asked by the Postoffice Department if mail is slow.



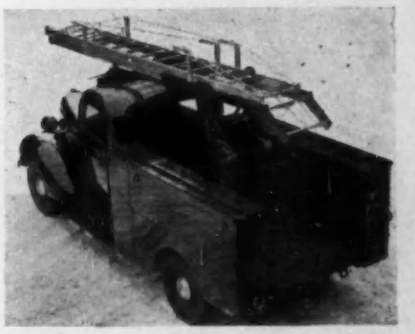
• • • • and from Coast to Coast thousands of new building projects must be supplied with communication and light and power facilities. Will you have the necessary service equipment?

GET SET NOW FOR YOUR NEEDS WITH "AMERICAN'S" REPLACEMENT PLAN

The American Coach Replacement Plan has been developed to speed up the delivery, to the Utilities, of the new Utility Body Trucks and mechanical equipment that will be so sorely needed after "V" Day.

Participation in this plan places you under no obligation. It does assure you, however, of delivery of trucks and equipment in the shortest possible time after government restrictions are lifted.

Here is a practical, easy solution of one of your post-war planning problems. Write, wire or phone for complete details.



A C & B

THE American COACH & BODY CO.

WOODLAND AVE. AT E. 93rd ST., CLEVELAND 4, OHIO

PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

EDITED BY J. S. REED JR.

Line AND Desk

Q. Please describe the method of making the "T" armor insulator tie used on maximum length spans of high tensile strength wire.

A. The method of making a "T" armor insulator tie is illustrated in Figure 2. Two BB iron tie wires 38" in length are required. (Do not use high tensile strength for this purpose since it is too stiff and would result in loose ties). Place the middle of one tie wire over the line wire at the edge of the insulator and start winding the tie wire around the line wire as shown in steps Nos. 1 and 2 of the illustration. Repeat the process with the second tie wire as shown in steps Nos. 3 and 4. Then take the two outer free ends of the tie wires "B" and "b" and make a half turn with each end around the insulator and wrap them around the line wire as demonstrated in the 5th and 6th steps. Cut off the ends at points "H" and "h" ¼" to ½" beyond the final twist. Bring the two inner free ends "F" and "f" around to the back of the insulator and twist together in a clockwise direction. Cut off the ends ¼" to ½" beyond the final twist.

Q. Why is it that more lightning punctures occur at the bend in the cable stub from a pole terminal to the cable than in any other place in the cable?

A. Lightning has a very high discharge frequency. Thus a single turn or bend offers high impedance to lightning discharges, causing it to discharge into an easier path, in this case through the insulation of the cable pairs to the sheath at the bend of the cable stub.

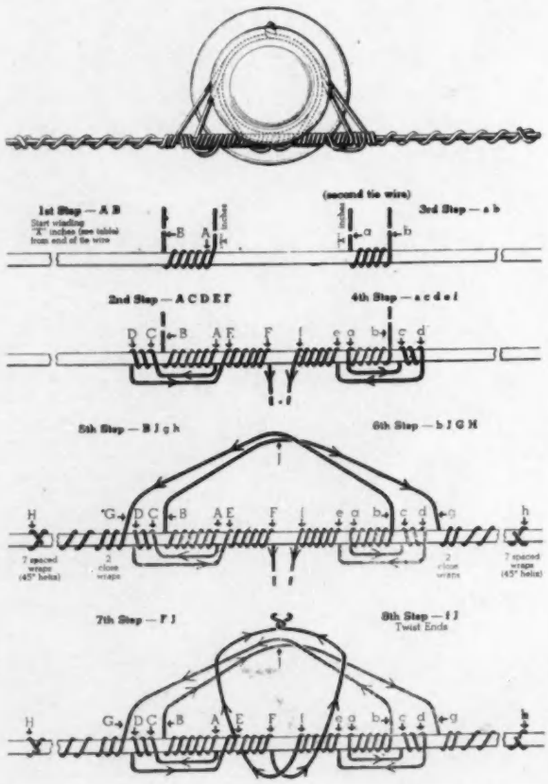

1st Step — A B
Start winding "A" inches (see table) from end of tie wire
(second tie wire)
3rd Step — a b
2nd Step — A C D E F
4th Step — a c d e f
5th Step — B J g h
6th Step — b J G H
7th Step — F J
8th Step — f J
Twist Ends
7 spaced wraps (45° helix)
2 close wraps

Figure 1—Showing how the "T" armour insulator tie is made.

Q. The T. V. A. recently built a 6500 volt line which runs parallel with my lines. My lines have as much as twenty volts, making them noisy and sometimes causing shocks at the switchboard. Although this power organization has helped me and I have made transpositions, this trouble has not cleared up entirely. How can I solve this problem?

A. We assume from your statement of the above facts that transpositions have been correctly made in **both** the telephone and the power lines. If that is the case, then any power induction in your lines must be the result of **electrical unbalance** in the lines. There are two sources of this type of unbalance, leakage to ground and unequal resistance of the two sides of a line.

Leakage results from contact of tree branches with the line, wires slipping off the insulators and resting in contact with the crossarm or pole, "sooty" carbon blocks in the subscriber's protector or in the central office protective equipment, and poor insulation in exchange cable. The leakage resistance of a farm line should not be less than 500,000 ohms per mile, or that of a toll line not less than 25,000,000 ohms per mile.

Unequal resistance of the two sides of a line is caused by open wire splices that have gone high or by poor connection between line wire and bridle wire.

If your lines make use of push button sets which connect the generator to ground for calling the operator, the grounded drop at the central office will upset the electrical balance of the line. A special circuit is necessary to eliminate this trouble, or a high impedance coil in series with the drop is needed. You might try using a high impedance ringer for the impedance coil. Such ringers have a D.C. resistance of 3600 ohms to 6000 ohms, depending on the manufacture.

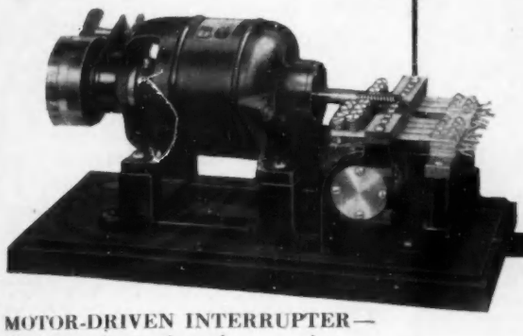
(Please turn to page 61)

MAGNETO RINGING MACHINE—
for exchanges up to 1,500 subscribers. One rotating element only . . . no brushes or collector rings . . . compact . . . provides audible ringing.

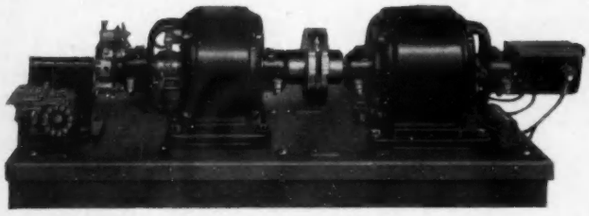
For Uninterrupted Telephone Service Use

HOLTZER-CABOT

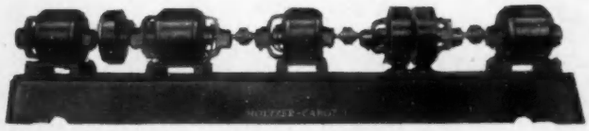
RINGING EQUIPMENT



MOTOR-DRIVEN INTERRUPTER—
eliminates slow-acting relays . . . gives positive timing . . . reduces maintenance.



RINGING MOTOR GENERATOR SET—
A compact set providing ringing current, tone and interrupter facilities . . . . Sizes 20 to 400 watts . . . can be furnished with A. C. or D. C. motor drive.



MULTI-FREQUENCY MOTOR GENERATOR SETS
For ringing harmonic party-line bells. . . . Sizes 50 to 150 watts . . . can be equipped with coin control current, tone and interrupter facilities . . . can be furnished with A. C. or D. C. motor drive.

4-FREQUENCY MOTOR GENERATOR—
no moving conductors . . .
low power consumption . . .
output 25 watts . . . can be furnished with A. C. or D. C. motor drive . . . can be equipped with tone and machine ringing interrupters.

Today's "heavy-traffic" demands call for efficient, dependable equipment in telephone exchanges.

Holtzer-Cabot Ringing Equipment . . . such as magneto ringing machines, motor-driven interrupters, alternating current motor-driven four-frequency sets, four-frequency motor generators and other motor generator equipment . . . are providing continuous, trouble-free service in telephone exchanges under all types of operating conditions. Their accurate, reliable operation has earned Holtzer-Cabot ringing motor generator equipment the unqualified approval of the engineering and service departments of all major telephone companies.

Solve your ringing problems with Holtzer-Cabot Equipment. Our engineers will gladly cooperate with you on your individual problems. Write for their services.

THE HOLTZER-CABOT ELECTRIC COMPANY

Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

125 Amory St., Boston 19, Mass. 6161 So. State St., Chicago 21, Illinois

Highlights of the Communications News

(Continued from page 44)

deprived of a status entitling their critical employees to deferment considerations, an adverse effect upon telephone service will result." **The USITA felt that the Inter-Agency Committee should list the communications industry among those regarded as critical.**

Commissioner Jett also quoted the following telegram from the A. T. & T. with the remark, "the statement applies equally to the telegraph industry":

"Any material reduction in the number of deferments in the Bell System would jeopardize the Bell System's ability to meet promptly the demands of the armed forces and war industries for telephone service and equipment and would mean a deterioration in the maintenance of the telephone plant, hence the quality of telephone service to all. Further, the numbers of employees skilled in those crafts required in the restoral of service breakdowns, due to fires, storms, floods, etc., is lower today than at any period during the last 15 years and any further losses in such critical occupations would seriously affect the System's ability to meet such catastrophies in a manner which the present war situation demands."

He added that the A. T. & T. had 28,000 men in the armed forces of whom 21,000 were taken from critical occupations or nearly 30 per cent of all men now employed in the critical occupations. Of 7,190 men in critical occupations in the Western Union Telegraph Company, 658 or more than 9 per cent have been withdrawn for military service.

OPA and Rates

Of great significance to the telephone industry, particularly the Independents, the intervention rights of the OPA Public Utilities Division in rate increase proceedings are to be entirely dependent upon the discretion of the regulatory commissions and the OPA Division can not widen the scope of rate investigations in presenting its views on proposed rate increases. These were the fundamental principles laid down by Justice Roberts in a 6 to 3 decision of the U. S. Supreme Court which ruled the OPA had no right to upset a $201,424,- rate increase granted the Washington Gas Light Company under the "sliding scale" regulatory plan by the District of Columbia Public Utilities Commission.

The opinion of Justice Roberts, clear-cut and direct, is most important for the telephone industry and all utilities in defining the powers of the OPA Public Utilities Division in the latter's interventions in rate increase applications.

Justice Roberts in his opinion directed most of the criticism of the Court's majority against the OPA Public Utilities Division counsel, although, of course, he was not mentioned by name. (The OPA counsel was Harry R. Booth, formerly FCC Telephone Rate Counsel.) The language of Justice Roberts was one of the most caustic characterizations about the attempt of a party to accede authority. His opinion stated that the OPA insisted they were entitled to control and direct the inquiry without regard to the statutory powers of the D. C. Commission. Incidentally, the Supreme Court decision was a notable victory for D. C. Chairman Flanagan who had blocked the efforts of Mr. Booth and the OPA to widen the proceeding to test the validity of the sliding scale method, with the OPA attorney being backed at every turn by the D. C. Commission's perennial dissentor, Commissioner Gregory Hankin.

Not Clear Right of Intervention Conferred

Most important to the telephone industry was the statement of Justice Roberts' opinion that "it is not clear that this language (in the Emergency Price Control Act requiring 30-day notice of increases in rates) confers a right of intervention." His opinion pointed out that the OPA Administrator had withheld from him specifically and expressly jurisdiction over public utility rates.

"If the petitioners were admitted as intervenors by a State Commission or by the District Commission ***, they might, of course, be ad-

"DON'T SIT THERE STARING AT THEM, GREGORY- YOU'LL MAKE THEM SELF-CONSCIOUS!"

mitted to participation in the proceeding upon reasonable terms; and one of the most usual procedural rules is that an intervenor is admitted to the proceeding as it stands and in respect to the pending issues, but is not permitted to enlarge those issues or compel an alteration of the nature of the proceedings *** it would seem then that, in the absence of clear legislative mandate to the contrary, the petitioners (OPA) should not possess greater rights than other intervenors."

OPA Appeals Illinois Central Case

THE Independent telephone industry has mainly sought rate increases during the war because of rising costs of operations and wages, but it must be stressed that for the most part, the OPA Division leading officials and attorneys have been most cooperative in their considerations of the Independent industry's problems. The OPA Division has sought a Court appeal in the recent grant of a $70,500 rate increase by the Illinois Commerce Commission to the Illinois Central Telephone Company. The OPA Division appealed this order to the state courts. There is a distinct difference between the Illinois Telephone appeal and the Washington Gas Light proceedings in that the OPA attorneys in the telephone inquiry confined their issues solely to the rate increase problem and the bill of particular issued by the Illinois Commission.

(The OPA Division also submitted briefs to the Ohio Commission in regard to the rate increase sought by the Ohio Standard Telephone Company in four of its 77 exchanges. The OPA is taking the position in this proceeding that on system-wide basis the Ohio Standard is earning a rate of over 10% and the projected increase in the four exchanges would be inflationary.)

Justice Roberts said the Supreme Court majority, in view of its decision in the Davies Warehouse case, is unable to revise its position and to infer from a general expression of Congressional policy "the limitation of existing powers conferred by law on regulatory commissions throughout the nation, both State and Federal, and the endowment of a different Federal agency with new and superior rights and powers."

OPA Division to Consult With Unregulated Carriers

(The Davies Warehouse decision of the court caused the OPA Public Utilities Commission to issue an amendment to its Procedural Regulation 11 in order to determine what future procedure in the filing of notices of intrastate rate increase should

HEMINGRAYS *ENDURE*

Put These Money-Savers On All Your Lines

HEMINGRAYS don't tax your operating budget. They actually save money because they outlive poles, hardware and crossarms; "keep up their money-saving efforts for 50 years"—one prominent utility reports.

A SECRET glass "batch-mix" — climax of 87 years of experience—plus Owens-Illinois quality-controlled production, results in Hemingrays free of voids, stresses and strains . . . so homogeneous that sudden changes of temperature leave them unimpaired to work perfectly through sun, rain, hail, snow and sleet.

3 FAVORITES ON RURAL LINES—

Sturdy, all-purpose Hemingray Number 16. Hemingray Number 42, with its long leakage path keeping "toll" lines trouble-free. Number 9 (illustr.), with its drip point petticoat for fast moisture runoff. Get samples.

LOW IN COST and long in service-life . . . sold only by principal jobbers.

DISTRIBUTED BY:

STROMBERG-CARLSON COMPANY

Factory and General Offices: Rochester 3, N. Y., U. S. A.

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AMERICAN CROSS-ARM, INC.

YOU CANNOT BUY BETTER CROSS-ARMS

Than Those Which Bear the Trade-Mark

"DEPENDABLE"

★ THEY ARE WELL SEASONED

★ THEY ARE FROM THE BEST GRADE OF WASHINGTON FIR

★ THEY ARE SHIPPED PROMPTLY

★ THEY ARE RIGHT IN ALL WAYS

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be followed by telephone and telegraph companies, other utilities and common carriers in the states where there are no regulatory commissions. For the telephone industry there are but three such states—Delaware, Iowa and Texas. For telephone and telegraph companies in states with regulatory commissions the present requirement of 30 days' notice to the OPA on proposed rate increases remains unchanged.

(It was decided by the OPA Division through its Director Robert Nixon that a consultation should be held with the carriers and utilities in the unregulated sections of the country to determine whether the increase rate notice should be required or whether area maximum rates should be established for these unregulated industries in which the reported increases appear contrary to the stabilization program or to extend the scope of complete exemption. Mr. Nixon distributed to the carriers and utilities an 11-page questionnaire covering all these points so that he could obtain a consensus of their viewpoints.)

Hearings on International Communications

HEARINGS on the Senate Resolution to study the international communications and merger issues by the Senate Interstate Commerce Committee may be staged within six weeks or two months—the latter part of May or early June.

This was felt to be likely as a result of the Senate approval of a $5,000 fund for the inquiry and the appointment of Edward Cooper as the Committee's chief examiner-clerk for the Committee in conducting the investigation. Lieutenant Cooper, who handled the Senate Committee's study of the legislation which brought about the acquisition of Postal Telegraph by Western Union, was detached from the Navy on temporary inactive duty with a civilian status after the Senate Committee had requested this assignment from Secretary of the Navy Knox.

The Senate Committee had asked Secretary Knox if the policy of the Navy would permit Mr. Cooper being made available for this work because of his excellent qualifications to handle the details of such a legislative inquiry based on his experience with the domestic merger. It was understood that Secretary Knox offered the fullest cooperation of the Navy due to the great importance of international communications as a national policy, ruling that Lt. Cooper could be detached as a reserve officer on inactive duty for the period that would be necessary for him to engage in this work for the Senate. It was presumed that after the conclusion of this work Lt. Cooper would resume active duty with the Navy.

Undoubtedly, a Subcommittee of the Senate Interstate Commerce Committee will be formed to handle the inquiry. It is possible that such a body would only be a small one and might even be composel of the three sponsors of the Senate Resolution (187)—Senators Wheeler, McFarland and White.

A series of informal preparatory conferences is felt desirable to acquaint such a Subcommittee with the magnitude of the problems in connection with international communications. This would include consultations with the leading representatives of the governmental agencies and of the international communications companies. Thus, the Subcommittee after such preparatory work, it is felt, would be in a position to conduct constructive hearings on the proposal for an international consolidation. However, it is believed that the pros and cons of unification among the American international companies would be a major issue, if not the most outstanding one, to be considered by the Senate body.

Telephone Man Admits "It's A Horse On Him"

This was definitely not horseplay to old dobbin!

Blanche, an aging white mare, driven by a retail fruit merchant, was clopping sedately down a New York street with her loaded wagon when the whiffle-tree snapped. Blanche broke loose from the fruit wagon, reared, kicked, and bolted—straight for an open manhole.

Down in the manhole, a telephone maintenance man was cheerily going about his business of inspecting and repairing telephone wiring. Suddenly he heard a scuffling sound overhead. A minute later he looked up to see a wildly-kicking left hind foot of a large white horse. Blanche had crashed through the "Men Working" barrier in the street and had stepped into the open hole. The hoof began to flail about, and the telephone man began to crouch and dodge.

Muttering, "What is this? A foxhole on the home front?" the beleagured telephone man crawled through a connecting tunnel and escaped through another manhole.

Blanche—disconsolate, but little the worse for wear—was hauled out of her manhole nest by a crane.

President Roosevelt Signs Anti-Slug Bill

THE anti-slug bill which is expected to aid telephone companies in their losses from the slugs and tokens in pay stations became a law April 3 with the signature of President Roosevelt. The measure was finally enacted by Congress last week when the House concurred in the Senate's amendments without a conference.

The bill makes it a felony to manufacture, sell or advertise for sale slugs or tokens for fraudulent use. Clyde S. Bailey, executive vice-president of the United States Independent Telephone Association, presented the case of the telephone industries on the measure before the Senate and House Judiciary Committees. During peacetime the Bell System had a loss of approximately $1,500,000 and the Independent telephone industries between $250,000 and $300,000 in slugs used in pay stations. The Bell System has in service approximately 600,000 coin operated telephone stations and the Independent between 75,000 and 100,000.

Ohio Bell Receives National Security Award

The Ohio Bell Telephone Company has received the National Security Award from the United States Office of Civilian Defense and up to the time of the presentation on March 31 was the first Ohio utility to be so honored.

The award was presented in the lobby of the Ohio Bell headquarters building in Cleveland to Randolph Eide, the company's president, by Colonel Manford G. Henley, of Columbus, O., regional director of the Fifth Civilian Defense Region. With it went a flag, presented to Mr. Eide by Ralph Stone, of Columbus, state defense director.

Applying to the company as a whole throughout the state, the award was in recognition of "the maintenance of a superior standard of protection and security. Effective joint efforts to safeguard production, employees and property have made possible the achievement which stands as a mark of distinction in the Nation's war effort."

Douglas Williams, Vice President, Southwestern Bell Telephone Co.

Williams, Mabon Named

Douglas Williams, assistant vice-president of the American Telephone & Telegraph Co. Information Department since 1938, took over April 3, the post of vice-president of the Southwestern Bell Telephone Company in charge of advertising and public relations. In New York, Prescott C. Mabon, who has been information manager of the A. T. & T. since 1940, was appointed assistant vice-president to take the place of Mr. Williams.

Mr. Williams was elected to the Southwestern Bell vice-presidency to succeed Vincent M. Carroll, who died March 16, by that company's board of directors on March 28. He had served as A. T. & T. assistant vice-president in the Information Department since April 1, 1938. His election was announced by President A. O. Stannard.

The entire telephone career of Mr. Williams, prior to his coming with the A. T. & T., was with the Southwestern Bell at St. Louis, the city of which he is also a native, so that he is extremely familiar with activities of that company. He entered the Southwestern Bell in May, 1922 as advertising manager for the states of Missouri and Arkansas. In 1929 he was appointed general advertising manager of the company and served in that position for nine years before going to New York.

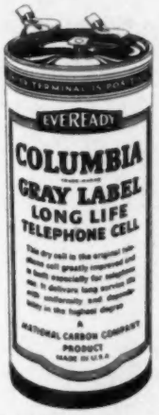
Mr. Mabon came to the A. T. & T. Information Department in July, 1939, after having been for 5 years with the Southern New England Telephone Company. He became A. T. & T. information manager in 1940. Prior to joining the Southern New England Telephone Co. in March, 1934, he had been engaged for 9 years in advertising and publicity work in New York and Boston. Born at Tarrytown, N. Y., he graduated from Harvard College in 1925.

It has been 60 years since the first conversation over an experimental long distance telephone line between New York and Boston.

Painter Made Director By Southwestern Bell

Earl H. Painter, vice-president and general counsel of the Southwestern Bell Telephone Co., was elected a director of the company to succeed Vincent M. Carroll, former vice-president in charge of public relations, who died March 18, at a meeting of the board of directors March 28. Mr. Painter had been in charge of the company's Legal Department since 1933 and was elected vice-president in October, 1943.

Long Life Telephone DRY CELLS



The quality cell preferred by telephone engineers.

"Eveready"
"Columbia"
"Gray Label"

Developed in America's largest dry battery laboratory, this Cell is designed to give both ***longer life*** and ***higher sustained voltage.***

Engineered to one standard of superior quality by specialists in battery manufacture.

Made by the makers of "Eveready" "Air Cell" Operators' Transmitter Batteries.

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SERVICE . . .
SAFETY . . .
CONVENIENCE . . .

CHANCE
(A. B. CHANCE CO.)
SAFETY CABLE CARS

Chance Cable Cars embody every important factor for safety, service, and convenience. Correctly balanced for comfort, and provided with holes for attaching safety belts. Each car is equipped with hand brakes and, if desired, can be furnished with wheel guards for added safety.

Two types: Rigid and Flexible. All flexible cars are adjustable.

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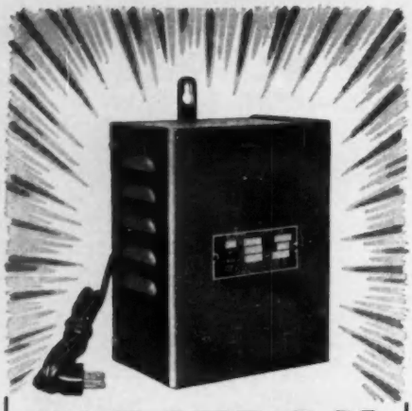

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Phone Men in Seabees Get Together

Seven former employees of telephone companies now members of the Navy Seabees, have a reunion in the "editorial room" of "The Guadalcanal Beachcomber", Seabee battalion newspaper of which Harry G. Strugnell, (seated) Electrician's Mate Second Class, USNR, is editor.

SEVEN Navy Seabees at Guadalcanal worked side by side as members of a Naval Construction battalion for more than a year unaware that they all had been formerly employed by telephone companies and five of the seven had worked within the same division of the Pacific Telephone and Telegraph Company.

Harry G. Strugnell, Electrician's Mate Second Class, USNR, stumbled over the relationship while gathering material for a communication article for "The Guadalcanal Beachcomber", battalion newspaper of which he is the editor. Strugnell, who lived at 400 Avila Street, San Francisco, was employed in the Administration department of the San Francisco Plant of the Pacific Telephone and Telegraph Company for ten years.

His fellow employees and brother Seabees are: George J. Spring, Electrician's Mate First Class, USNR, of 1346 26th Avenue, San Francisco; Folkert T. Thiessens, Electrician's Mate First Class, USNR, of 326 Bryan Avenue, Salt Lake City; Donald W. McCoskey, Electrician's Mate First Class, USNR, 130 Roanoke Street, San Francisco; and Ernest N. Watson, Electrician's Mate First Class, USNR, 309 9th Street, Pacific Grove, California.

The latter spent four years at the Monterey Plant and is now working in the battalion's electric shop while McCoskey, Spring and Thiessens, engaged in communications work on the island, had eight, four and two and one-half years service respectively at the San Francisco Plant.

The other former telephone employees are Ira J. Lambes, Electrician's Mate First Class, USNR, of 486 Westmoreland Street, Akron, Ohio who had 17 years of service with the Northeastern Division of the Ohio Bell Telephone Company and James S. Rockefeller, Electrician's Mate First Class, USNR, 1507 McDivitt Street, Compton, California, with eight years at the San Pedro Plant of the Southern California Telephone and Telegraph Company.

Lambes is now battalion radio repairman and electrician at the Seabee-built "Coral Bowl" motion picture projection booth while Rockefeller is a member of the communications detail.

All are on military leave of absence from their civilian companies and have been overseas with the Seabees more than twelve months.

A Florida judge ordered a man whom he found guilty of disorderly conduct to pay a $10 fine and telephone police headquarters thrice daily for eight days to report that he was behaving himself.

AN ANSWER!

Geographic Magazine map shows the distance of 614 miles from Dalhart to Austin. It is closer to the capitals of the following states:

New Mexico, Arizona, Colorado, Kansas, Oklahoma, Arkansas, Nebraska.

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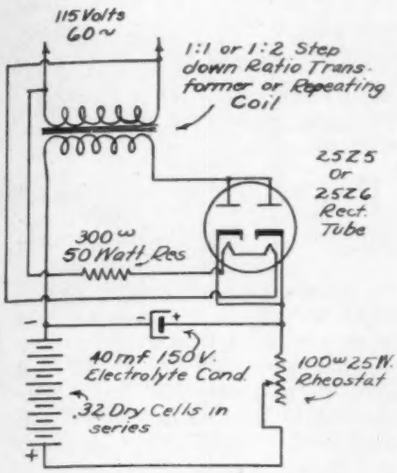
Line & Desk

(Continued from page 54)


115 Volts 60~
1:1 or 1:2 Step down Ratio Transformer or Repeating Coil
2525 Or 2526 Rect. Tube
300~ 50 Watt Res
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32 Dry Cells in series

Figure 3. Suggested circuit of simple charger for depolarizing dry cells.

Q. I have been told that it is possible to reclaim flashlight or other types of dry cells by recharging them in a manner similar to that used for storage batteries. How is it possible to do this?

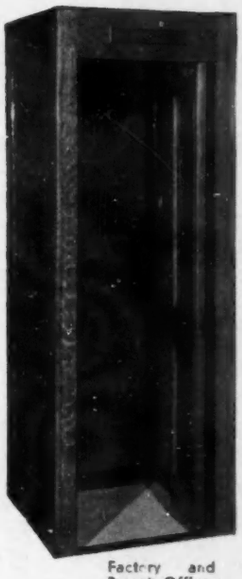
A. Certain firms having occasion to use flashlights in considerable quantities have tried charging flashlight cells with good success. The method used is to pass about 0.15 ampere of direct or rectified alternating current through the cells in a direction opposite to their normal polarity for four to eight hours. What apparently happens is that each cell is de-polarized, resulting in the restoration of their normal voltage and current capacity. As a matter of fact, the voltage may rise to as high as two or more in contrast to the nominal value of 1.5 to 1.65 volts for a new cell. A higher charging rate will only overheat the cells and cause them to expand due to an accumulation of chlorine gas inside the cell container. Figure 3 shows the circuit of a simple charger that may be used for charging the cells. An 0-250 milliammeter should be inserted in series with the batteries and the charger circuit to insure that the charging rate is held to 150 milliamperes.

An ordinary storage battery charger may be utilized if a sufficient number of dry cells are connected in series with it to produce not more than 0.15 ampere charging rate.

New cells are most satisfactorily recharged after they have been used several hours and then returned for recharging. After being charged, they must be put aside for four hours to allow the voltage to fall to a stable value before being placed in service. They should be returned to service as soon as possible after the rest period since then tend to deteriorate if left on open circuit. Eventually the cells will refuse to respond to the recharging process and must be discarded. By that time, however, they will have given at least three times their normal service. Old cells that have never been de-polarized by this process cannot be recharged, especially if they are nearly exhausted. It is impossible to recharge the so-called heavy duty or industrial type flashlight cell even when new. It is inadvisable to try to de-polarize cells that show signs of leakage.

Colonel Treest Awarded Legion of Merit

Colonel Ira H. Treest of the Signal Corps, who recently retired from active service as Chief of the Communications Engineering Branch of the Army Communications Service, was awarded March 29 the Legion of Merit for his outstanding service in that post.



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RAYTHEON RECTICHARGERS
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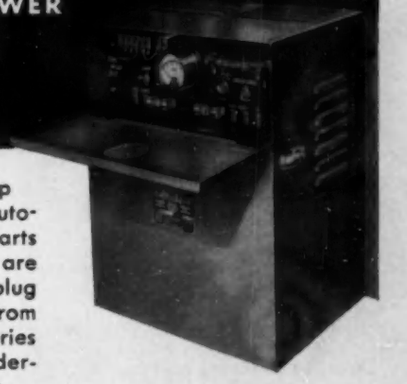
IN UNATTENDED STATIONS



Because Raytheon RectiChargeRs keep batteries fully charged . . . are entirely automatic in operation . . . have no moving parts . . . and require no maintenance, they are ideal for unattended locations. Simply plug them in . . . adjust the charging rate and from then on RectiChargeRs will—keep batteries charged . . . prevent overcharge and undercharge . . . eliminate voltage variations . . . increase battery life . . . reduce battery maintenance and inspection to one or twice yearly.

A Raytheon RectiChargeR and Batteries provide an automatic AC-DC Telephone Power System

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Electrical Fundamentals For the Telephone Man

(Continued from page 46)

1.	Low Frequency	0 to 133 cycles
2.	Voice or audio frequency	100 to 10,000 cycles
3.	Carrier frequency	10,000 to 100,000 cycles
4.	Radio frequency	100,000 to 56,000,000 cycles
5.	Ultra-high frequency	Above 56,000,000 cycles

Table No. 2—Classification of A.C. Measurements

the quantitive conditions in the circuit. Even most types of voltmeters which indicate circuit potential require current for their operation.

Galvanometers

ONE of the simplest electrical measuring instruments is the galvanometer. The galvanometer is an instrument used for measuring the strength of the electrical current by means of the magnetic effect which the current will produce. Galvanometers are not used in many practical applications outside of the research laboratory or the school classroom. They are interesting, however, in our study of electrical testing instruments as the principle on which they operate is similar to that of the modern ammeter and voltmeter.

There are two types of galvanometers which may be classified as:

1. Those utilizing a fixed coil and a moving magnetic needle.

2. Those utilizing a fixed magnet and a movable coil.

Figure 3 illustrates the fixed coil-movable magnet type of galvanometer. It will be observed that this instrument consists essentially of a fixed coil and a small magnet which is pivoted so as to be free to move in the axis of the coil. An indicating needle is attached to the magnet and

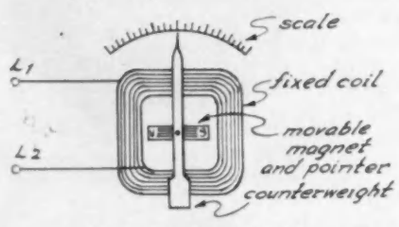

Fig. 3.—Fixed Coil—Movable Magnet Type of Movement.

a counter weight provides the controlling force which prevents a weak current from deflecting the moving element as far as a strong current. An indicating scale over which the indicating needle travels gives an indication of the magnitude of the current measured.

The principle of operation of this type of instrument is simple. When direct current is passed through the fixed coil, a magnetic field is created in the coil, and this causes the small magnet to attempt to align its axis with that of the magnetic flux which threads the coil. This exerts a turning effect on the magnet which moves the indicating needle over the scale. The amount of movement is proportional to the magnetic flux created by the current flowing in the coil. The counter weight provides the necessary controling force.

Movable Coil-Fixed Magnet Type of Galvanometer

A MORE popular type of galvanometer movement is that which utilizes a moving coil and a fixed magnet. This type is illustrated by Figure 4. It consists essentially of a coil that is pivoted free to move between the poles of a permanent magnet. Current is passed through the coil from the source to be measured and the magnetic field set up around the coil interacting with the flux between the poles of the permanent magnet causes the coil to deflect over a calibrated scale.

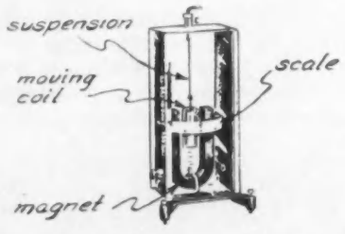

Fig. 4.—Moving Coil—Fixed Magnet Type of Movement.

This coil is in some galvanometers suspended on a flat phospor bronze wire which tends to exert a controlling force to prevent a weak current from deflecting the coil as far as a strong current.

Modified Form of Movable Coil Fixed Magnet Type of Galvanometer

THE sensitivity of the moving coil type galvanometer can be substantially increased by arranging a soft iron core which is attached to the permanent magnet and around which the moving coil revolves. This tends to concentrate and increase the magnetic flux through the coil and thus increases the sensitivity of the movement. Most modern instruments are of this type. Figure 5 illustrates this type of movement.

Galvanometers generally employ delicate coils which are suspended on fibre, quartz, or flat bronze strips, and they are used primarily as a current balance indicator in Wheatstone Bridges and other similar measuring equipment. Ordinarily the most common use of the galvanometer, namely the Wheatstone Bridge, does not require that the galvanometer dial be calibrated in micro or milliamperes inasmuch as the galvanometer is used merely as a balance indicator to show whether or not current is present in the circuit.

Galvanometer Sensitivity and Resistance

THE sensitivity of a galvanometer is usually rated in terms of the number of ohms or megohms which when placed in series with the instrument will result in a deflection of one scale division when one volt is applied to the galvanometer terminals. Some galvanometers are also rated in terms of the number of microamperes required to produce one scale division.

Galvanometers which are used in laboratories where extreme sensitivity is required generally have a small lightweight mirror attached to the moving coil rather than an indicating needle. A light beam from some focusing type of lamp is focused on the mirror and the reflected light beam is thrown on the calibrated scale which may be placed several feet away from the galvanometer. In this way the apparent sensitivity of the instrument is greatly increased as small deflections are magnified by the length of the reflected light beam.

Galvanometers are available in either the low resistance or the high resist-

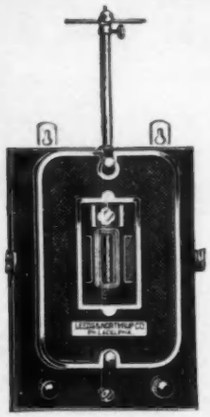

Fig. 5.—Reflecting Galvanometer Type of Moving Coil Instrument

ance type. The low resistance galvanometer is one having a few turns of fairly heavy wire. Where voltage sensitivity is required instruments with a great many turns of fine wire are most suitable. The galvanometer shown in Fig. 6-1 is of the suspension type and is for use with wheatstone bridges.

Damping the Coil Movement

WHEN current is passed through the moving coil of a galvanometer the initial magnetic pull causes the coil to swing beyond the point at which it will finally come to rest. The controlling spring tends to pull it back to normal and will tend to make it go too far in the opposite direction. The result is that the moving coil may oscillate back and forth for an appreciable length of time before finally coming to rest. This is objectionable because of the time lost in waiting for the coil to settle down. Electrical instruments therefore must be provided with some means, either electrical or mechanical to bring the indicating needle or coil to rest quickly after current is applied. This is referred to as damping and may consist of either some form of mechanical damper, as for example an aluminum vane arranged to swing in a small airtight chamber, or what is known as electrical damping which consists of winding the coil on an aluminum frame which has current induced in it when it moves through the permanent magnet field and this current in turn produces a field of its own which reacts with the permanent magnetic field and tends to bring the coil to rest after current is applied. Figure 7 illustrates the mechanical method of damping.

A moving coil type of movement can also be damped by an electrical shunt across the moving coil terminals. The shunt acts as an electrical brake on the moving coil due to the voltage created in the coil winding as

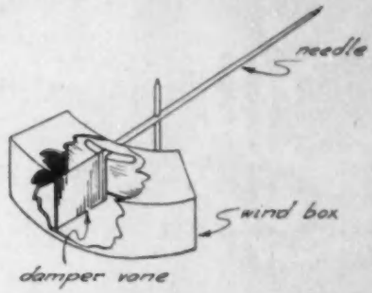

Fig. 7.—Mechanical Method of Damping A.C. Instruments.

Fig. 6-1.—Portable Galvanometer for use with Wheatstone Bridge.

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The S-20 is expertly engineered and rigidly constructed to give maximum satisfaction. Protector units are installed only as needed. The pole bracket reduces installation labor. Drop connections, fuses, and lightning dischargers are at the front and are easily accessible.

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the result of its movement in the magnetic field, sending a current through the winding and shunt. The electromagnetic field thus created around the coil reacts with the permanent magnet field to slow down or "brake" the coil movement.

The mechanical type of damping arrangement is generally used only with A.C. instruments.

Basic Movement of D.C. Instruments

THE basic movement of most D.C. voltmeters, ammeters, ohmmeters, etc. is a modified form of the moving coil type of galvanometer described in previous paragraphs.

The chief difference between a good moving coil galvanometer and a good D.C. ammeter, or voltmeter is in the use of a pivoted type jewelled bearing support for the moving coil in the ammeters and voltmeters as compared to the flat wire suspension usually used in galvanometers.

Because ammeters and voltmeters are used in everyday practical work under a variety of conditions, and must be built to withstand abuse, a rugged pivot type support for the moving coil is necessary. Extreme sensitivity is not required as is the case with galvanometers, hence nothing would be gained by a suspension type support.

Modern D.C. ammeters and voltmeters employing the moving coil-soft iron core-permanent magnet type of mechanism are referred to as having the D'ARSONVAL movement, after a scientist by that name who was responsible for developing the moving coil instrument.

Essential Parts of D'Arsonval Meter

AS used in modern D.C. instruments the D'Arsonval movement consists of the following basic elements.

1. The moving coil
2. The permanent magnet
3. The soft iron core
4. The indicating needle
5. The scale (also called dial)
6. The front and back hair springs
7. The pivotal assembly and zero adjustment
8. The pole pieces

These various parts are illustrated in Figure 8.

The soft iron pole pieces and the soft iron core serve to concentrate the magnetic flux from the permanent magnet through the moving coil. The front and back hair springs serve the dual purpose of providing a controlling torque, and as a means of carrying current into the coil winding.

The pivots and associated jewels are of course the means of coil support, and the zero adjustment permits setting the needle on zero should the spring tension change enough to throw it off zero.

As is fully explained in the next section, D.C. ammeters and voltmeters both utilize substantially this same basic D'Arsonval movement, the chief difference between them being in the arrangement of shunt and series resistances used in conjunction with the moving coil.

(TO BE CONTINUED)

EXAMINATION NO. 11
Basic D.C. Movements

1—Why will a low resistance voltmeter give an inaccurate reading when used on a high impedance source?
2—What reading will be obtained if a 2000 ohm voltmeter (0 to 200 volts range) is used on a potential source of 200 volts, the internal impedance of the source being 1000 ohms?
3—Is a voltmeter likely to be "burned out" if accidentally connected in series with a circuit?
4—What is meant by the statement "direct current instruments are magnetically polarized"?
5—Explain the theory of the fixed coil-moving magnet type of galvanometer.
6—Why is some form of controlling force required in galvanometers?
7—Explain the operation of the moving coil-fixed magnet type of galvanometer.
8—What type of movement is employed in the best type of D. C. measuring instruments?
9—What are the essential parts of a modern D'Arsonval ammeter and voltmeter?
10—Explain the electrical damping method of controlling movement in a D. C. instrument.

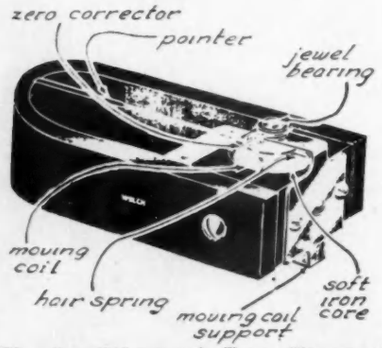


Fig. 8. — D'Arsonval Type Movement used in all modern D.C. instruments.

Device Shows How Tired a Heart Gets

Tired hearts which furnish strength to hands manipulating explosives are a source of potential danger to workers in the munitions industry.

Physicians at one of the country's largest explosive manufacturing companies recently called upon electrical science to help them ferret out cases of heart fatigue among workers in certain departments before the tiredness became so great as to cause fainting.

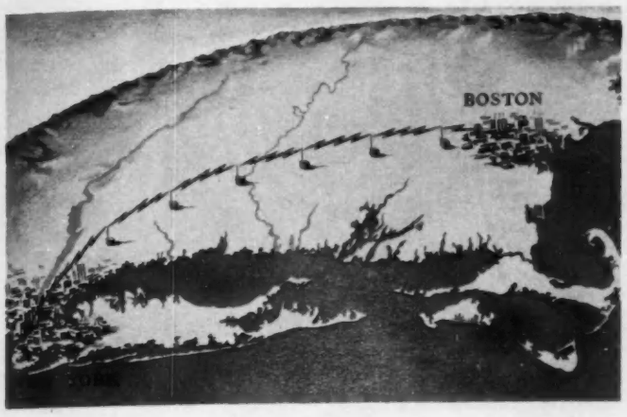
The instrument they are using is called a "sound frequency analyzer", developed by Western Electric Company, manufacturing and supply organization of the Bell Telephone System. A great deal more sensitive than the stethoscope, it picks up, analyzes and records the heart sounds that disclose fatigue conditins that induce fainting.

The doctors use the instrument regularly to chart the heart sounds of workers unavoidably subjected to chemical fumes causing heart fatigue. From these charts they are able to tell the degree of heart fatigue suffered by each person. Workers whose charts show heart fatigue are immediately transferred to other departments, to avoid danger to themselves and to other workmen in the plant handling explosives.

Army of Phone Operators

A force of 185,000 operators, the largest in history, was serving the Bell Telephone System at the end of 1943. More than 125,000 new operators were hired during the year to meet the heavy turn-over in personnel. For the entire Bell System, the proportion of women employees increased to nearly 70 per cent of the 425,000 total and the number of Bell System men and women in the armed forces grew to 53,000.

Bell Plans $2 Million Intercity Link



This diagram illustrates how New York and Boston will be linked by a radio relay system of the American Telephone and Telegraph Company. The experimental system will supplement present long distance telephone wire lines and will provide facilities for transmission of television programs between New York and Boston.

Plans for the trial of a new type of intercity communications facility were announced March 17 by the American Telephone and Telegraph Company. The work will take at least two years to complete and will cost more than $2,000,000. It will supplement present commercial long distance telephone facilities and provide network facilities for the transmission of television programs between New York, Boston and intermediate points.

Application is being made to the Federal Communications Commission for approval to begin the project, which is expected to proceed as rapidly as the war situation permits. At present engineers of Bell Telephone Laboratories essential to technical phases of the undertaking are engaged in war work.

The new system will be operated by radio relays of a type which was under development by the Bell Telephone Laboratories prior to the war. This system applies to communication by radio many of the techniques which have played an important part in the development of long distance wire telephone circuits. Directed radio beams at ultra-high frequencies will operate simultaneously in both directions and these will be relayed at stations spaced at an average of about 30 miles throughout the route. It is hoped that, ultimately, each radio beam will carry a large number of communications channels.

This is the first plan for a system of this type to handle regular commercial long distance telephone messages over land within the United States and it is believed that it will be the first to handle commercial communications services anywhere in the world.

This project represents another step in the march of radio telephony to utilize shorter and shorter wave lengths. Overseas commercial radio telephony to England was initiated by the Bell System in 1927 using very long waves. Soon afterward "short waves" were developed for transocean telephony and today, except for the war, it is possible to talk from any telephone in the United States to more than 70 foreign countries and to any of more than 95% of all the telephones in the world.

Using still shorter waves, only two or three meters long, which do not travel much beyond the horizon,, radiotelephone service was established just before the war across Chesapeake Bay between Norfolk and Cape Charles, across Massachusetts Bay between Boston and Provincetown, and between the mainland and Smith and Tangier Islands in Chesapeake Bay.

The new project proposes to use microwaves which are shorter than have heretofore been used for commercial telephony.

The principal purpose of the trial is to determine by practical operation in commercial service the relative advantages and disadvantages of radio relay in transmission of long distance messages and television programs compared with transmission by the familiar wires and cables and recently-developed coaxial cables. Relative costs represent only one of the factors to be determined; others include the relative quality of transmission, flexibility under actual operating conditions and and dependability.

Postwar plans were recently announced for a country-wide extension by the Bell System, by about 7,000 miles, of its coaxial cables suitable for telephone service and the transmission of television programs.

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Drop Wire—Bridle—Interior—Tree—Ground—Switchboard—Pothead—Cable Terminal—Instrument—Fixture—Buried Wire

Wartime Maintenance Of Outside Plant

(Continued from page 32)

Point of Wire Crossover	Minimum Vertical Clearance
Track rails of railroads	27 feet
Streets, alleys or roads	18 feet*
Residence driveways	10 feet
Spaces, or ways accessible to pedestrians only	8 feet

*In a few states this is 20 feet. Local requirements apply.

Notes: Minimum vertical clearance is the height from the crown of the road to the lowest point in the wire directly above. For wires running along streets and alleys the recommended vertical clearance is 18 feet in urban and 15 feet in rural districts. Pole guys crossing a road must maintain the minimum required clearance.

Table 3—Minimum Vertical Clearances for Open Wire and Pole Guys.

will be needed to enable the lineman to climb through the lower arms to work on the upper wire level.

Dead End Points

AN improperly constructed dead end point on a cross-arm lead will cause considerable trouble. If a single crossarm has been used at this place, the arm will bend or break under the strain of the pull of the line wires in the direction of the lead. A double arm construction is absolutely necessary for dead ends. If the wires are dead ended as shown in Figure 9, the tendency for the insulators to pull over under the strain will be reduced. Figure 10 illustrates a good dead end construction for a joint pole lead.

For bracket leads where trouble is experienced with dead end brackets pulling out, a good method of reinforcing brackets is illustrated in Figure 11. When metal clips cannot be obtained for reinforcing brackets, the alternative method is shown in Figure 12 may be utilized.

A standard method of making a dead-end wire tie is given in Figure 13.

Pole Guys

POLE guys tend to loosen and must be retightened at each overhaul. If a defective guy must be replaced or a new one installed where needed, care should be taken to correctly install the guy so that it will hold the pull and not fail under abnormal stress caused by storms.

The lead/height ratio of a guy should be equal to 1.0 or greater to keep the stress at a low value. (Lead is the horizontal distance of the pole to the anchor, and height is the vertical distance of the center of the wire load to the ground).

Guys for bracket leads may be .203 galvanized steel or BB wire, while 2200 pound strand is satisfactory for a 10-wire lead where the lead/height ratio is 1.0 or more. Heavier wire leads need 6,000 pound strand, and if a lead/height ratio of .3 to .5 must be used, two guys with 6,000 pound strand will be required.

The proper size anchor should be selected when installing guys. There are a number of different types of anchors on the market; therefore, the maintenance man should be familiar with the sizes of anchors suitable for guying work and the kind of soil in which they are to be used. Such information is available from the manufacturer.

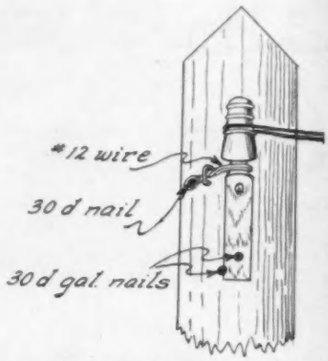

Fig. 12. Alternating method of reinforcing dead end brackets.

Other Line Wire Conditions—Wire Splices and Connections—Slack Wire

BAD line splices are a prolific source of noise, crosstalk, and poor transmission. This trouble is due to poor electrical connection resulting from corrosion of the conducting surfaces of the splice. The remedy is to locate and cut out defective splices, replacing them with good permanent points, by using the modern splicing methods with compression or rolled sleeves.

When making the splices, the wire ends must be thoroughly cleaned as the first step. Do not take it for granted that galvanized wire is clean because it looks clean. It usually has a film of grease and dirt that will eventually cause the splice to go bad if not removed by sandpapering. A good method of cleaning the wire before

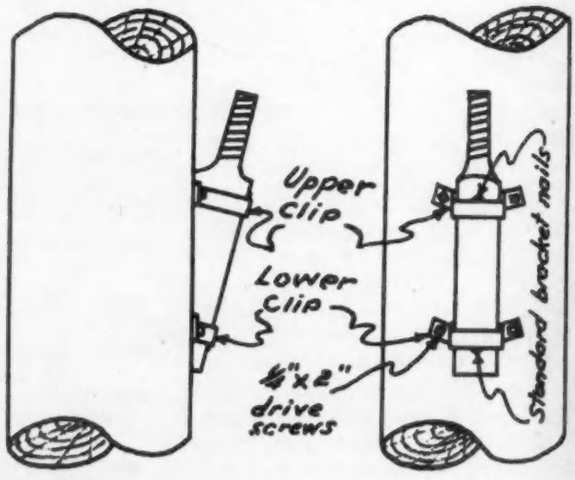

Fig. 11. Method of reinforcing dead end brackets that tend to pull out.

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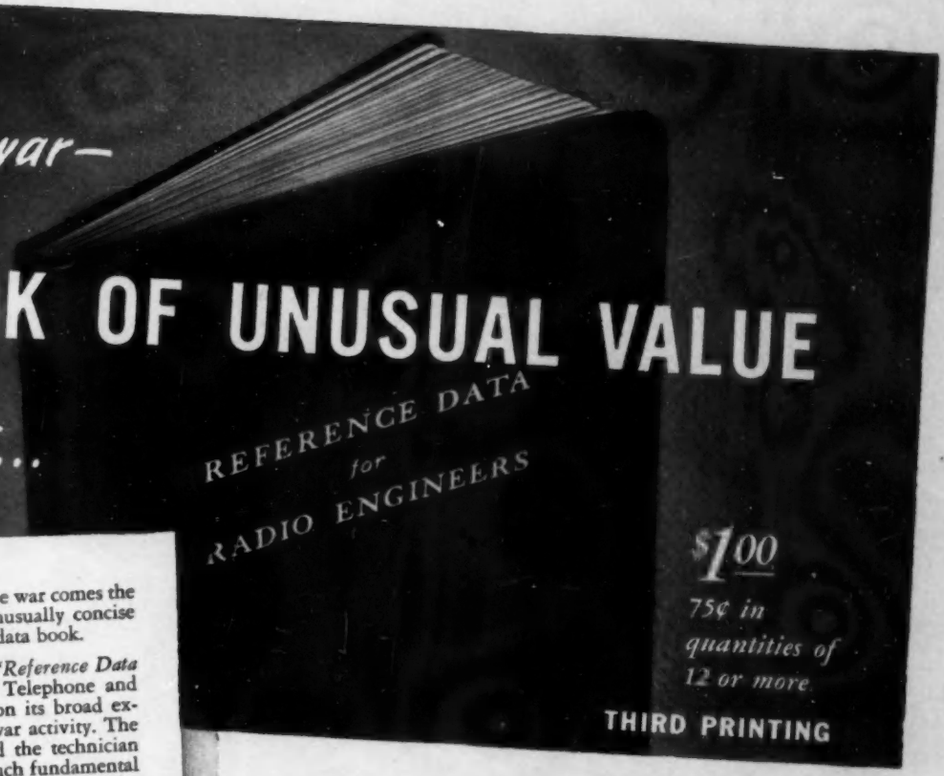

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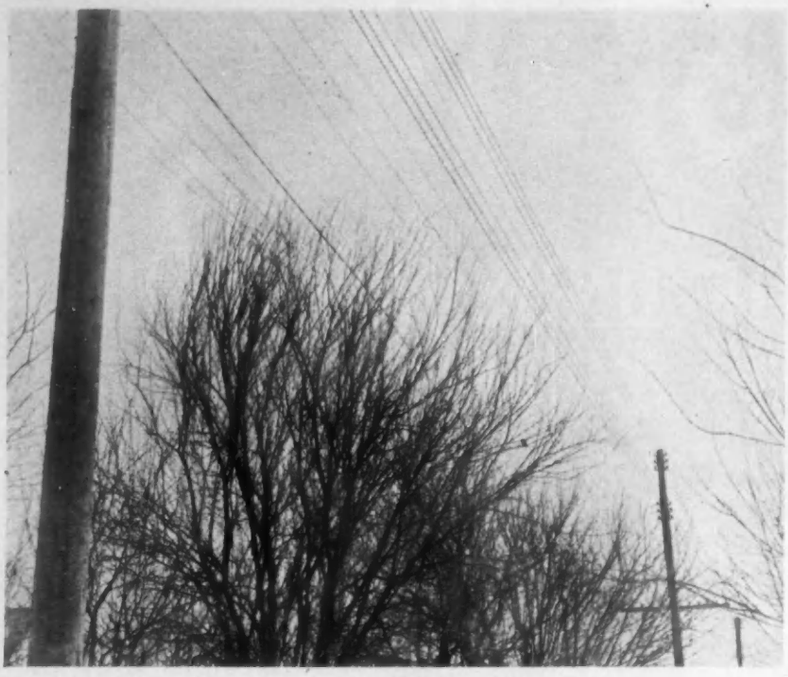

Fig. 16—Trees should not be permitted to interfere with overhead lines.

splicing is to rub it with a No. 120 grit emery cloth.

Bad splices are readily located by means of mile by mile checks. The resistance of each section is measured and compared with a record of previous measurements, a low-resistance ohmmeter being used for this purpose. If the resistance of a certain section seems high, all the splices in that section should be checked. A tool that can be used for checking the resistance of individual splices is illustrated in Figure 14. This tool should not be pressed down hard over the splice as this may cause it to change resistance and appear to be normal.

Excessive slack in wire spans should be taken up, and if any uneveness occurs in the wires of a span the wires should be carefully lined up, otherwise shorts and crosses will occur with annoying frequency as the result of the wires swinging together in the wind.

To prevent undue tension on the wires as the result of restringing jobs, the sag should be carefully measured as shown in Figure 15 and the sag corrected to result in the desired amount of wire slack as shown in Table 4.

Obtaining Open Wire Clearances from Trees

TREES should be kept from coming in contact with open wire leads to prevent leakage through tree foliage which results in poor transmission, noise, and under certain circumstances, crosstalk. Figure 16 illustrates an undesirable case of tree interference with a wire lead.

As a rule tree trimming work should be performed in winter and should be completed by the time the spring overhaul is started, otherwise the maintenance man may find little time in which to accomplish both programs. However, any tree pruning that is not yet done should be finished as soon as possible.

In general the amount of tree pruning to be done on any one tree should be sufficient to provide a two year trimming cycle.

A good deal of tree trimming can be avoided by locating the wire line so that trees will not grow into the line. That is not always so easily done but the ingenious use of side arming, pole top rakes, and line offsets will accomplish much. Figure 17 illustrates an example of the use of side arms to avoid tree interference on an open wire lead.

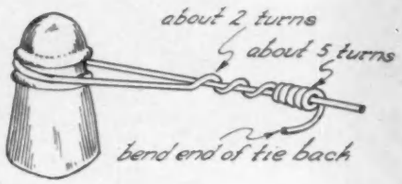

Fig. 13—Standard bracket dead end tie.

Conclusion

MORE can be done in the matter of successfully carrying cut a spring maintenance program than would have been possible in the past two years. Although no actual construction is as yet possible without express permission of the W.P.B. and then only for purposes vital to the war effort, much work of a maintenance nature can be performed to keep present telephone lines operating at as nearly top efficiency as is possible with the present labor shortage.

In addition it is possible to make limited extensions or rearrangements of telephone plant that will result in conservation of material that can be

Length of Span in Feet	Temperature in Degrees F					
	0°	20°	40°	60°	80°	100°
100	3.5	4.	5.	6.	7.5	9.5
120	4.5	5.5	7.	8.5	10.5	13.5
140	6.5	7.5	9.5	11.5	14.5	18.5
160	8.5	10.	12.5	15.	19.	24.
180	10.5	12.5	15.5	19.	24.	30.5
200	13.	15.5	19.	23.5	30.	38.
220	16.	19.	23.	28.5	36.	46.
240	19.	22.5	27.5	34.	43.	54.5

Table No. 4—Sags Recommended for .104 Copper Wire or .109 Iron Wire.

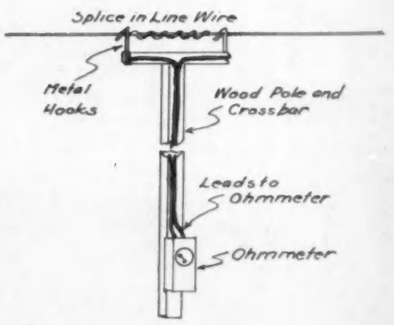

Fig. 14—Tool for measuring resistance of individual splices.

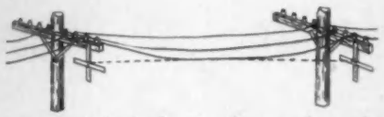

Fig. 15—Method of measuring sag in a wire span.

used elsewhere for current maintenance operations. For example, an extension of a cable lead may be made to recover drop wire that can be repaired and reused elsewhere in current operations. Also farm lines may be rearranged to shorten main rural lines by placing subscribers on other and shorter lines of the exchange.

Relief from serious line conditions requiring extensive use of critical material may be obtained if appeal is made to the W.P.B. and its approval secured. This fact should be particularly helpful to small companies with grounded lines affected by excessive power induction. In such cases W.P.B. may grant approval to request for permission to convert grounded lines to metallic by adding another wire to each line for the express purpose of relieving a bad power induction situation.

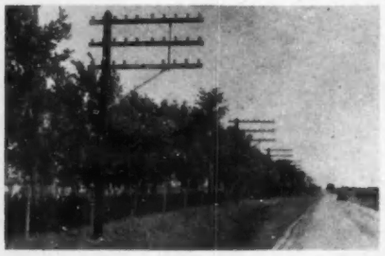

Fig. 17—Use of side arms to avoid tree interference.

All companies should make use of their priorities to obtain needed material. When an appeal to the W.P.B. is necessary, valuable help in the preparation of the required forms can be received from salesmen and jobbers in the telephone field.

(END)

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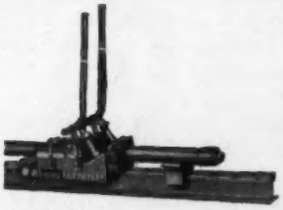

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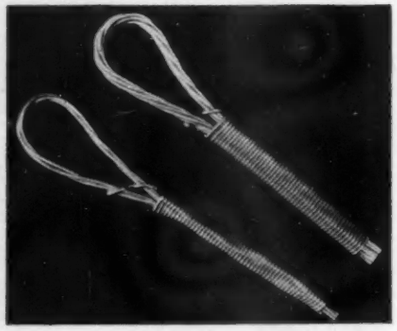

Fig. 1—Typical dead end serves on 3- and 7-wire strands.

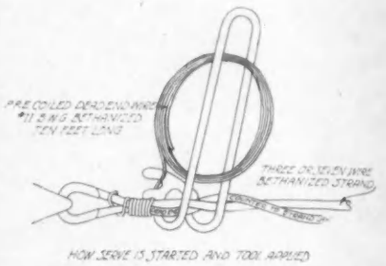

Fig. 2—With strand made for serving the dead end wire wrapping is started with a simple hooked engagement of the strand and one or two turns by hand before the tool is applied.

AN interesting technique for making dead ends with bethanized strand has been made possible by the introduction of a special tool recently devised by the Research and Development Department of Bethlehem Steel Company. While the tool was originally designed for use with the familiar breakdown serve, for which it is excellently suited, later work has resulted in an improved procedure which may be termed the "dead end wire" or "serving coil" method. As the latter expression indicates, it involves the use of a small coil of dead end wire which is put on by means of the new tool.

The dead end wire method works equally well for all grades of strand, while break-down serves should not be made on Extra High Strength grade. Furthermore, both methods should be limited to bethanized strand. The action of the tool may damage some hot-dip zinc coatings, whereas the ductile, closely bonded bethanized deposit is left intact, although it may possibly show a slight displacement at some points of contact.

In making regular break-down serves, using lineman's pliers, continuously controlled tension is not attainable, because it is necessary to release the wire between turns, to take a new grip. This condition naturally has an adverse and variable effect on the uniformity of the holding power of the serve, an effect which becomes more and more pronounced with increasing strength of strand.

Furthermore, a lineman, no matter how skilled, will usually damage the zinc coating with his pliers, thus causing some impairment of the corrosion resistance of the strand at the points of injury. This damage also becomes increasingly aggravated as higher strength strand is used. The combination of these features has resulted in a general abandonment of the old technique in favor of various types of clamps.

THE new tool, designed to overcome these difficulties as far as bethanized strand is concerned, consists of a primary winding element with developed prongs which so engage the wire that continuous tension is induced as the wire is wound. Chromium plated contact surfaces, hard smooth and well rounded, minimize displacement of the zinc. The tool has been found practical for making break-down serves in strand of Common, Siemens-Martin, and High Strength grades, in A, B, and C weights of bethanized coatings.

Althougth the new tool has made possible a greatly improved break-down serve, the dead end wire procedure offers such important advantages that it may well be expected to find uses to which the former technique was never applicable. It involves the use of a small separate coil of 11-gage bethanized wire, 120 in. long, sufficient to make 50 full turns, or 6 in. of wrapping, on 7/16 in., 7-wire strand.

Wire from the coil is wound around the live and dead ends of the strand, a minimum of 50 turns being sufficient to develop holding power beyond the usual strength of the strand. To avoid complications in stocking and warehousing, only one grade and one length of wire coil is supplied. When used for the smaller sizes of strand

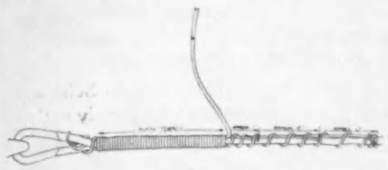

Fig. 3. Vibrations-dampening dead end assembly. Fifty turns of service wire is sufficient wrapping to prevent slippage under load beyond the useful strength of the ruralductor.

the slight excess of wire may be wound in extra turns, or cut off.

The new method has the advantage of being considerably faster than the break-down procedure. Another important feature is, that take-ups can always be made, because the strand is not destroyed, as in break-down serves. When a take-up is required, the original dead end wire is removed, slack is taken up by the usual method, and a new dead end wire put on.

REMOVAL of the dead end wire is done by lifting the outer end (the end farthest away from the loop) so that the lower prong of the tool can be engaged under it. The wire is unwound 8 to 10 turns, which opens it into a helix approximately three times the diameter of the strand. The tool is then removed and the balance of the wire taken off by hand.

The tool is so simple that any lineman can be taught its use in a few minutes. The winding tension on the wire is steady, not intermittently applied, and the resulting holding power obtained does not depend primarily on the strength and skill of the lineman. It is a much simpler operation than that of making a serve with pliers, as no great effort is required in gripping and holding the wire. The tool does this automatically.

Extensive tests have proved that the tool adapts itself to the varying sizes and contours of strand around which it rotates, and that it produces consistently tight wrapping throughout the length of the serve.

Tests have also demonstrated that inexperienced men can make serves after watching only one being made. In a recent series of such tests the poorest specimen held without appreciable slip for a pull of 10,300 lbs., with a rated strand breaking strength of 10,800 lbs. All other specimens broke in the main strand outside the serve.

The tool moving across the ridges of parallel strands produces light indentations on the outer wire surfaces of the strand. However, the action is a displacement rather than a removal of the coating, a condition that is not considered serious, because, as is well known, zinc displaced in this manner exerts a protective influence on the adjacent thinned areas.

AN interesting application of the new technique is a vibration-dampening dead-end assembly on three-wire ruralductor, as illustrated in Fig. 3. A jumper wire of soft steel is laid in the valley between strands, and fifty turns of dead end wire applied. The jumper wire is thus firmly

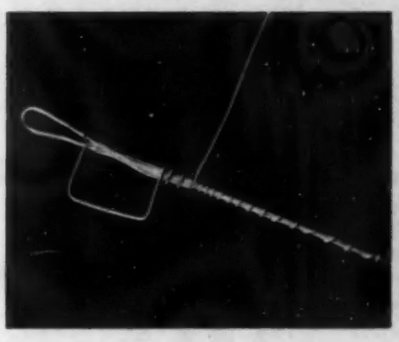

Fig. 4. Dead end assembly with tap for hot line clamp.

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secured, without interfering with the holding power of the dead end and in a manner that insures good electrical contact. Upon completion of the fifty turns the tool is removed and the jumper wire bent back. The come-along is then taken off and the individual wires fanned back. The three wires are cut to lengths of 1 in., 5 in., and 10 in., respectively, and the remaining dead end wire is wrapped by hand as indicated. This arrangement provides an effective vibration damper and takes the place of an assembly requiring the use of three separate clamps.

A similar arrangement used for providing a tap for hot line clamps on three-wire ruralductor is shown in Fig. 4. In this case the end of the jumper wire is shaped into a loop, the free end of which is wrapped around the serve, thus providing a stirrup for the hot line clamp. In the conventional installation of this type four clamps are usually required.

Peebles Addresses Texas and Kansas Conventions

EMPHASIZING the reasons for the rejection by the War Production Board of the telephone industry's program for resumption of a limited number of telephone instruments, Leighton H. Peebles, Director of the WPB Communications Division in addresses before the annual meetings of the Texas Independent Telephone Association in Dallas March 14 and the Kansas Independent Telephone Association in Topeka, March 16 stated that plans are being developed by the War Production Board for a reconversion back to peacetime economy when circumstances permit and urged that each telephone company review its own situation, make its plans for postwar operation, "but wait to implement them until the situation is clearer than it is today."

Mr. Peebles explained the recent revisions of the U-2 and U-3 Orders and the current changes in Forms WPB-2117, WPB-2774 and WPB-617. He urged the companies to supply complete information in their appeals on Form WPB-2117 so that his Division does not have to request additional data or would not take improper action on an appeal because of insufficient facts. Form WPB-2774 for materials required on a project in excess of $2500 or when the total cost of materials required is in excess of $5000 is important particularly in regard to the information on the requirement of workers and companies were asked by Mr. Peebles to answer this question as accurately as possible because the Communications Division cannot recommend a priority rating until it has cleared with the Area Urgency Production Committee on the labor urgency situation. He pointed out that urgency committes are now operating for the entire West Coast and the areas surrounding Hartford, Cleveland, Akron, Detroit and Buffalo.

In regard to the telephone instrument situation, Mr. Peebles told the two Independent Telephone Associations that it now appears there will be enough instruments made available through ordinary disconnections to provide service for Schedule A applicants. "Under unusual circumstances," Mr. Peebles declared, "this may not be the case and consideration will be given by the WPB to permit an operator to obtain instruments for meeting his Schedule A requirements for service. If such a condition arises, however, the Communications Division will inquire of the operator just what disposition has been made of disconnected instruments, during the previous several months, for it is the operator's duty to anticipate Schedule A requirements in so far as it is possible to do so.

"It does not seem desirable as long as an operator's experience indicates that disconnections will meet his Schedule A requirements for service to maintain an unnecessary inventory of instruments for prospective Schedule A subscribers. However, it is expected that when Schedule A demand is known or reasonably anticipated every effort will be exercised by operators to insure that Schedule A service requirements are met without the need of additional telephone instruments being manufactured for that purpose.

"As one method of meeting this problem, it is required that every effort be asserted to remove telephone instruments immediately from subscribers premises upon discontinuance of service; also you should review the requirements of subscribers whose operations have been curtailed. For instance, instruments might be obtained from air-raid warning sectors or other locations where the requirements may be less than formerly."

MR. PEEBLES lauded the voluntary redistribution program under which equipment and materials that otherwise might have remained unused in a company's inventory was available to other companies. He noted that it had been in operation for several months and that the Industry Advisory Committee had characterized it as "of considerable value" and desirable to be continued under present conditions. He added that report forms associated with this program will, therefore, continue to be required from the operating telephone companies.

The Communications Division Director related that the functions with respect to the necessity certificates for amortization of construction, reconstruction, erection and installation of facilities in the interest of national defense for tax purposes have been transferred from the War and Navy Departments to the WPB. It is now provided, he said, that an application for necessity certificates be filed with an application for priority assistance if tax amortization is desired. Necessity certificates will no longer be granted on construction started after December 17, 1943, unless they are acted upon prior to such construction being initiated, he added.

The underlying principles behind the Conservation Order L-41 have not been changed, Mr. Peebles stated. This means, he declared, that if it is determined a building is required to meet essential requirements for service, certain materials cannot be used in the construction of the building that normally would be desirable under peacetime operations. In other words, a telephone company cannot build as good a building as might be desirable in normal times.

Mr. Peebles lauded the assistance and advice of the Telephone Operations Industry Advisory Committee as having been of "inestimable value." At the Texas Association meeting he commented on the

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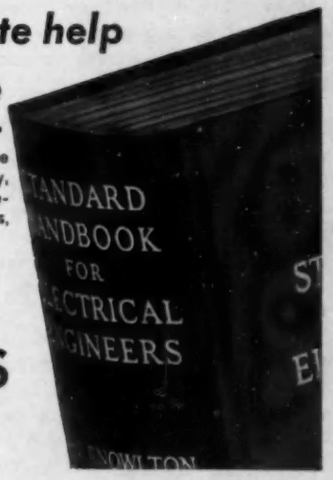

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25 YEARS AGO THIS MONTH

Taken from TELEPHONE ENGINEER files of April, 1919.

In the April, 1919 TELEPHONE ENGINEER, Company 3 of the 413th Telephone Battalion claimed the speed record in installing lines for the A.E.F. Forty men in one day had set 136 poles, 6 stubs, placed 69 cross-arms, gained and framed 2 poles, 3 gains, strung and tied in 2-wire circuit, a total of four and one-half miles of wire, and dug 12 poleholes in rock (dynamiting each hole). Thirty-nine of these men had done almost as much the day before.

★

The story of a multiplex telephone system which they had seen in Brazil as told by P. E. Erickson and E. D. Johnson was carried in TELEPHONE ENGINEER. The line in question was leased for night service to two newspapers, one in Rio and the other in Sao Paulo. Three telephone instruments were connected at each end of the line, and a man stationed at each—one speaking French, one speaking Portuguese and one speaking English—then they all started talking. The results were very fine from the point of view of the newspapers and they felt they certainly got their money's worth out of that line.

★

The commander of one brigade of artillery attached to an American division in the Meuse-Argonne offensive was particularly annoyed by enemy wire-tappers. He realized that no code is impregnable when experts get to work on it. So he sent two Sioux Indians who were members of one of his companies to either end of his communication line with the instructions that any messages they handled were to be transmitted in the language of their fathers. The Sioux, their artillery commander and their colonel enjoyed the situation immensely and the Germans were unable to "decode" their messages.

★

Twenty-five years ago the commissioner of internal revenue ordered on and after April 1, 1919, a tax of 10c had to be paid on all toll line messages which were charged at 51c or over, and 5c tax on messages charged under 51c. The tax in effect previous to the order was 5c on all calls of 15c or more.

participation in the committee sessions of that organization's president, Oscar Burton. He noted that the committee members rendered "a patriotic and important public service" and that they paid all their own expenses and contributed their own time without charge to the government in attending these meetings. "I cannot speak too highly of the service the committee members have rendered their country," Mr. Peebles commented.

Pointing out that the manpower situation and the continuation of the high peak of military orders with its prospect of twelve months' work ahead for the communications manufacturing industry were the major reasons for not allowing resumption of telephone instrument production, Mr. Peebles asked the telephone industry to consider these factors when they read about other civilian goods being sanctioned for manufacture such as ice boxes, flat irons, etc. War production, he said, cannot be classed as a single program and in the case of communications equipment "the immediate war needs are still rising."

Expressing the hope that the 1944 war production task will not be hampered by uninformed criticism, he emphasized that the War Production Board realizes the resumption of production of equipment necessary to reestablish normal utilities service "should rank high in any program for releasing restrictions. It is, however, the settled policy of the WPB not to permit production for less essential civilian requirements where to do so would threaten interference with production for military use." He noted that J. A. Krug, Chairman of the WPB Requirements Committee and Director of the Office of War Utilities, had confirmed this position of WPB Chairman Nelson to the affect that slight increases in allotments to the Office of Civilian Requirements in the second quarter of this year did not indicate any change of the WPB's general policy of restricting such production to basic essentials.

Gantt Named by IT&T

Robert A. Gantt, formerly vice president of the United States Commercial Corporation in charge of the Communications Division, has been appointed a vice president of International Telephone and Telegraph Corporation, it was announced Mar. 27.

Mr. Gantt joined the United States Commercial Corporation in 1942 to set up its personnel and program to handle the many communications problems of the organization throughout the world. Prior to leaving to do this work, Mr. Gantt had been with I. T. & T. for 14 years, having joined

Robert A. Gantt, Vice President, International Tel. & Tel. Corp.

the organization in 1928. His assignments, as vice president of Postal Telegraph and Cable Company, included organizing and directing the conversion of that Company's operations from Morse telegraph to printing telegraph. Later, Mr. Gantt was placed in charge of I. T. & T. interests in the Balkans and served in that capacity during the first year of World War II. He was elected a vice president of I. T. & T. on January 12, 1939, resigning this position when he entered government service.

A native of Falls City, Nebraska, Mr. Gantt's experience in the communications field dates to 1900. He graduated from Nebraska in 1909 with the degree of B. Sc. in electrical engineering. From 1909 until 1928 Mr. Gantt was with the American Telephone and Telegraph Company. As general manager of the Pacific Telephone and Telegraph Company from 1925 to 1928, Mr. Gantt supervised and directed the introduction of automatic telephone equipment in the San Francisco Bay region, as well as the installation and erection of the San Francisco-Los Angeles Toll Cable.

This is Conservation!

The Bell Telephone System has broadened and intensified its program of conserving strategic materials and of getting the maximum use out of existing facilities. Use of new copper was reduced from a peak rate of 92,000 tons a year to about 6,000 tons in 1943 and the latter figure was more than offset by the 10,000 tons of Bell System copper salvaged and returned to the national pool.

H. E. LaPlante Dies Suddenly

Harry LaPlante

Harry Edward LaPlante, manager of the Government Contract Service Department of Automatic Electric Sales Corporation, passed away unexpectedly on March 20 at his home in Park Ridge, Illinois, at the age of 54. Death was attributed to heart disease.

Mr. LaPlante had been an employee of Automatic Electric Company or its affiliated organizations for nearly 37 years. His passing came as a severe shock not only to his family and his fellow workers, but also to the large number of people outside of the organization to whom he had become well and favorably known through his many years of service to the business. A man of warm personality, with broad sympathies and a keen sense of humor, he was quick to make friends with all those with whom he came in contact. His high ideals, his unswerving devotion to whatever he undertook, and his constant readiness to help others, were characteristic, and added greatly to the esteem in which he was held by his associates.

Educated in the Chicago public schools, Mr. LaPlante entered the employ of Automatic Electric Company in 1907, while he was still in his teens. His first assignment was in the cost accounting department, where he quickly showed marked aptitude. In 1912, we was transferred to the sales department, where he undertook special assignments relating to costs and pricing. Later, he was appointed manager of the pricing division, a position which he continued to occupy until 1936. In November of that year he was assigned to the executive staff for whom he undertook special duties. Returning to the factory organization after two years, he was next employed as staff assistant to the general superintendent.

In August, 1940, he again joined the sales organization, and was appointed manager of the Government Contract Service Department, a position he held until his death. In this work, he had supervision over the complex and exacting service procedures growing out of the Company's rapidly expanding participation in the production of apparatus and equipment for the armed forces.

Mr. LaPlante is survived by his widow, Hazel M. LaPlante; a son, Harry E., Jr., 18 years old, now serving in the United States Army; a daughter, Jane, aged 13; and three younger brothers, George, Howard and Edward.

During 1943 the U. S. Army Signal Corps procurement program involved the expenditure of about five billion dollars worth of communications equipment, of which 60 per cent was for radio.

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Look Forward

To Growing Rural Needs!

By RAY W. SMITH, Editor

RURAL America promises to provide a broad and fertile field for the expansion of telephone service after the war. This conclusion has been reached by telephone men and by manufacturers of equipment after independent surveys of the potential market.

Reasons advanced for this conclusion are numerous. First, and of significant importance, is the marked rise in farm income. Cash income on the 6,096,799 farms of the country (1940 census) has shown an average increase of three and three-quarter billions of dollars each year for the last three years. Income, including government payments for 1943, is estimated to be $19,678,000,000—more than double that reported in 1940. This represents an average of approximately $3200 per farm.

Vast Market Still Without Telephone Service

THE 1940 census reported a total of 1,526,954 farm telephones in service—an average of 25 telephones for every 100 farms throughout the nation. The ratio of telephones per 100 farms for the different sections of the country varied with the farm income. The 13 Mid-Western states, with 62 per cent of the total farm telephones, reported 41 telephones per 100 farms. The New England and Mid-Atlantic states and the District of Columbia, with 14 per cent of the total, averaged 39 telephones per 100 farms. The 13 Southern States, including Texas, with 15 per cent of the total, reported 8 telephones per 100 farms. The 11 Rocky Mountain and West Coast States, with 9 per cent of the total, listed 28 telephones per 100 farms.

In the interim between 1940 and March, 1942, when the War Production Board issued its first limitation orders, there was almost an unprecedented demand for farm telephone service in many sections of the country. While exchanges met these needs, insofar as possible, the issuance of the restrictive orders found much of the demand still unsated. It is estimated that a large number of farm telephones have been installed since the census of 1940. Many of the remaining farms are potential prospects for service and, with farm income continuing to rise, it is believed that demands will reach new heights when materials for extending lines again are available.

Rural Electrification Helps Create Demand

THE rapid expansion of rural power lines prior to and during the war emergency period has resulted in creating a demand for telephone service in the same areas. Latest reports indicate that some 2,500,000 farms in America are being furnished electric power by central stations. If this figure is correct then there are nearly one million farms now receiving electricity which do not have telephones. This represents what appears to be a vast and logical market which the telephone industry will be expected to serve when conditions again permit.

Trend Toward Rural Residence

THE exodus of residents from the city to outlying suburban and rural acreage—a trend stopped temporarily by the war—will be renewed, and undoubtedly will be increased, when transportation restrictions are lifted. Real estate dealers report a growing demand for farms and small

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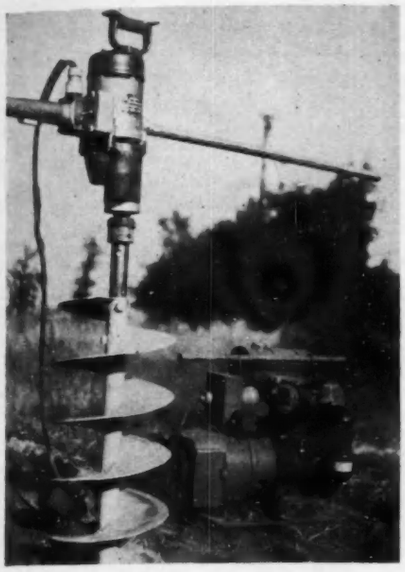

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"Sorry boss, the draft board changed its mind again".

acreages on the part of industrial workers. Many of these are reported to be conserving their war-time earnings with the thought of buying a "small place" as insurance against unemployment. This migration should result in still further demand for telephone service.

Subscribers Interested in Improved Service

THE desire for better communication service has manifested itself in a number of localities and, with the increased farm income, subscribers apparently are willing and able to pay for this improvement. To provide for necessary improvements many old lines must be replaced, new equipment must be installed, whenever materials —and man-power—again are available.

Because of regulatory restrictions —and lack of trained crews—the telephone companies have been forced to confine maintenance, during the war emergency, largely to necessary repairs. Mile after mile of rural lines have long passed the normal period of replacement.

Fortunately, during this period, companies have been able to build up a reserve with which to finance the tremendous amount of rehabilitation work that must be done. Plans for these improvements are well underway in the outside plant departments of most of the larger companies. Many of the smaller companies also have well-developed plans for extending and rebuilding their lines when the emergency ends.

Telephone men generally are thinking in terms of modernizing and improving their rural lines through the use of better materials and better equipment. Long-span construction, made possible by the high-strength steel line wire developed in the middle 30's, lends itself to a program of improvement and expansion. Experience has shown that stronger, safer lines can be built, utilizing better poles and better hardware, if necessary, where these high strength wires are employed. Construction costs are lower because fewer pole structures are required. This results in a saving of both material and man-hours. The long-span, lower-cost lines tend to broaden the frontier of rural service. Exchanges oftentimes find it economical—and profitable—to extend lines into remote areas where heretofore building costs made such investments unprofitable.

Use of Higher Strength Wire Will Increase

WHILE many companies will continue to specify HTL-85 line wire, the use of the extra high-strength HTL-135 is expected to increase in the post-emergency building era. The former provides for spans to 225 feet in the heavy loading district, 325 feet in medium and 375 in light loading areas. It contributes an added factor of safety when employed on existing pole structures with spans ranging up to 150 feet in the heavy loading district.

The HTL-135 line wire, with two and one-half times the tensile strength of standard B.B. wire, makes possible safe spans of 350 feet in heavy loading, 450 feet in medium loading and 500 feet in light loading districts. This means that the number of pole structures per mile in heavy loading areas may be reduced to approximately 15. This represents a saving of nearly one-half the poles which would be required if the line were built with B.B. wire. The number of poles per mile under light loading conditions need not exceed 11.

The telephone industry generally is alert to the growing rural needs and is making advance preparations accordingly. How soon it can proceed with its program depends upon the availability of essential materials and all important man-power.

Phone Company Seeks $2,500 In Damage Suit

The Illinois Commercial Telephone Company filed suit March 21 in circuit court asking $2,500 damages from the Corn Belt Electric Co-Operative. The suit asks damages for the use of the Continental Casualty Company which paid an award to Velma Tomblin, telephone company operator, under the workmen's compensation act.

The insurance company paid out $901.98 in compensation payments to Mrs. Tomblin, Bellflower operator, after she suffered loss of hearing from an electric shock March 20, 1943.

The complaint charges that Mrs. Tomblin suffered the shock when an electric co-op resident service line fell across the telephone company lines about two miles north of Bellflower. The resident service line crossed over the telephone lines, the complaint says.

The complaint charges that the electric co-op carelessly and negligently managed its lines by failing to properly insulate its transmission and resident service lines and by failing to support the service line properly.

Mrs. Tomblin was awarded $181.03 for temporary total disability, $660 for loss of hearing in her left ear and $60.95 for medical expenses, according to the complaint.

Lend-Lease Record

In observing the third anniversary of the passage of the Lend-Lease Act, Edward R. Stettinius, Under Secretary of State, and former Lend-Lease Administrator, Leo T. Crowley, Foreign Economic Administrator, both paid tribute March 11 to the effectiveness of the policy. Although neither statement mentioned specific supplies sent to her allies by the United States, FEA sources reported that in the three years of Lend-Lease, Russia, by far the largest user, has received 260,000 field telephones, 830,000 miles of field telephone wire, and 120,000 dry cell batteries, all for military needs. Smaller quantities of radio transmitting stations under one KW, receivers, radio beacons and radio direction finders were also shipped to Russia. The shipments of communications apparatus to other United Nations, much smaller, were not disclosed.

Owens-Illinois Executive To Assist WPB

F. J. Solon, vice-president and director of sales of Owens-Illinois Glass Co., has joined, temporarily, the staff of the War Production Board at Washington.

Mr. Solon, widely known in the glass industry and associated with the O-I sales organization for the past quarter of a century, will be away from the company and its Toledo general offices for a period of about 90 days. He began his new duties Apr. 1.

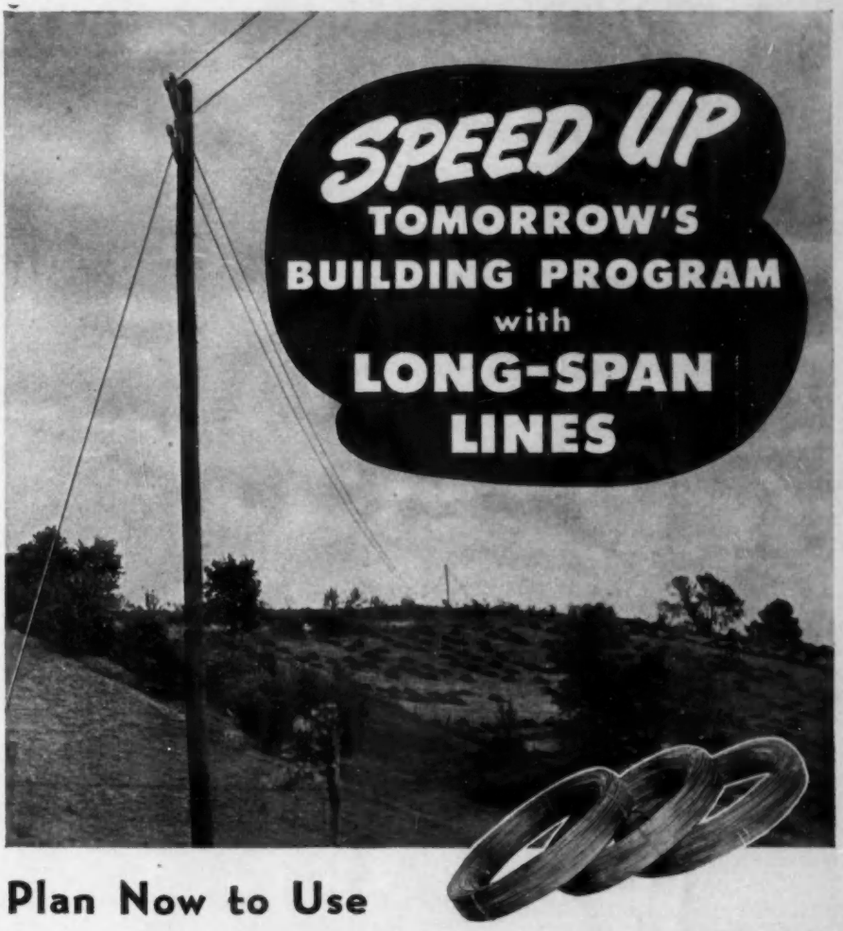
In his specific assignment at Washington, Mr. Solon will devote his efforts primarily to container problems, calling upon a long demonstrated organizing ability and overall knowledge of the packaging industry.

Signal Corps Given New Telephone Headset

A new telephone set has been provided for our fighting forces by Army Signal Corps engineers in co-operation with Bell Telephone Laboratories and the Western Electric Company.

The new set is the answer to the problem of how signal men can wear telephone headsets under the new-type steel helmets.

Similar in appearance to the hearing aid worn by civilians, the device has a small, soft plug that fits into the outer orifice of the ear and thus is a more effective seal against outside noises than was the bulky receiver with large rubber caps.



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In planning tomorrow's program for the extension and rehabilitation of rural circuits, be sure to take full advantage of the superior physical characteristics of these wires!

Crapo HTL-85, with 60% greater tensile strength than standard B.B. wire, permits spans of 225 feet in heavy loading to 375 feet in light loading areas. Crapo HTL-135 possesses two and one-half times the strength of B.B., makes possible extra long spans of 350 feet in heavy loading, 500 feet in light loading districts. Both Crapo HTL-85 and Crapo HTL-135 provide superior tranmisssion at voice-frequency.

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COMMUNICATIONS and ELECTRONIC Developments

Postwar Electronics

The adaptation of wartime electronic developments to the peacetime commercial future promises the wide use of many revolutionary devices, Dr. O. H. Caldwell, editor of Electronics Industries and former Federal Radio Commissioner, told the New York Electrical Society last week.

Dr. Caldwell foresaw small instruments operating on the "radar" principle preventing automobile collisions, warning of hidden crossroad traffic, and small obstructions in the path of the motorist. Radio controlled traffic lights, mounted on the dashboard, and audible "stop and go" signals are a possibility, he said. An automatic piloting device, not unlike that used by aircraft now, may control the car of the future through the use of a photo-electric "eye" focused on the white stripe in the center of the roadway, he stated, adding that photo-electric cells along the road may be used to "police" the speed of automobiles, transmitting reports automatically to a centralized police station. Even driving instructions may come in over the car's "control" radio, emanated from buried or overhead roadside cables and fed from central control units, Dr. Caldwell said.

New Antenna Idea

Radio stations transmitting microwaves will use small antennas and because of their high directivity can be nearer to each other geographically without interfering. There will be room in the air for a far greater number of messages.

This prospect was described by Dr. George C. Southworth and Lloyd Espenschied, of the Bell Telephone Laboratories.

The reason why pipe-type guides instead of wire are used is that microwaves need special attention to prevent leaking of energy and distortion. The pipes are useful for conveying the waves from their generator to the place where they will be used. The waves can also be radiated by simply flaring out the tube into a horn.

The new air roads of the future, engineers state, "will make the present channels look like a forest trail next to an express highway."

Spaghetti Speeds Communications

Spaghetti—uncooked but otherwise the same spaghetti you eat—has been put to work to speed the manufacture of electronic tubes used for war communications.

With their eyes still wide in amazement, veteran production men at the Westinghouse Lamp Division recently told how William A. Hayes, young electronics engineer discovered this novel war substitute that cuts by 75 per cent the time required to assemble certain tube filaments and reduce the need for critical steel.

A stick of spaghetti placed inside a tiny wire coil supports the coil while it is being welded, according to D. D. Knowles, manager of electronics engineering. A piece of steel formerly was used as the support but it was difficult to remove. Spaghetti can be burned out in a flash. Because of the important savings in time, man-power and materials, Mr. Hayes has been recommended for a WPB Award of Individual Production Merit. His method produces 50 per cent more filaments and at the same time allows assembly operators to spend part of their time on other production jobs.

Fig. 1—Mr. Hayes is shown examining a short stick of the uncooked food which is inside the wire filament coil where it served to support the coil during a welding process.

Temporary Filament Support

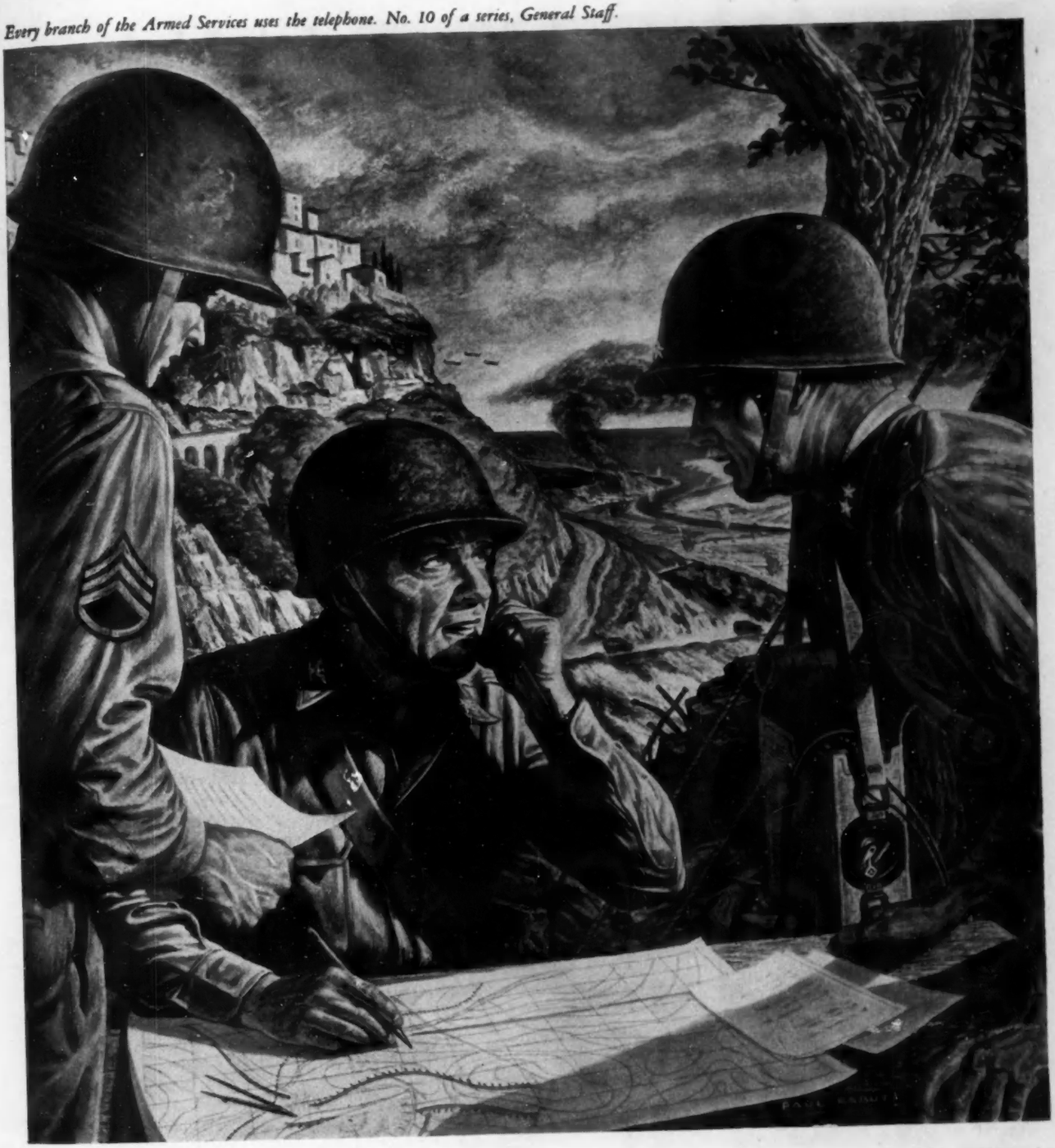
Wire filaments for many tubes are coiled in the shape of a small spring, three-quarters of an inch long. When each coil was being welded to the rest of the tube mechanism, a steel piece about as thick as a seven penny nail was inserted inside the spring coil to support it and keep it in accurate alignment. This steel piece had to be split with a saw before inserting it in the coil. Without the split, the piece was difficult to remove after the welding job because the coil tended to tighten around it. Sometimes removing the steel piece jarred the coil and it had to be realigned. The whole job was troublesome and time-consuming; thus Mr. Hayes was assigned the task of breaking the bottleneck.

After trying about everything else, Mr. Hayes tried spaghetti. Now a little stick of spaghetti is inserted where the steel piece used to go. After the filament is welded, electric current is passed through the coil to remove any impurities in the metal and this burns up the spaghetti in a flash. No spaghetti, no removal problem. This assembly operation formerly required about five minutes to complete for each tube filament, the engineer pointed out. By using spaghetti instead of steel, the job now can be handled in a quarter of that time.

Put Spaghetti on Lathe

Mr. Hayes explained that his idea didn't take final shape all at once. He visited the spaghetti manufacturer and found out how accurately it could be produced with regard to exact size. He

Every branch of the Armed Services uses the telephone. No. 10 of a series, General Staff.



At Field Headquarters sits a staff officer—telephoning. In his hands, this familiar instrument, now a weapon of war, controls the striking power of our forces in the whole area of combat. Over it flow the orders that will drive back the enemy till the final order—"Cease Firing"—is flashed to every front.

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The ablest officers and the bravest men can win this war only with *your* full support. They must have weapons, food, supplies—more and *more* and MORE of them. Make sure they get them. Buy War Bonds, *more* War Bonds and STILL MORE!

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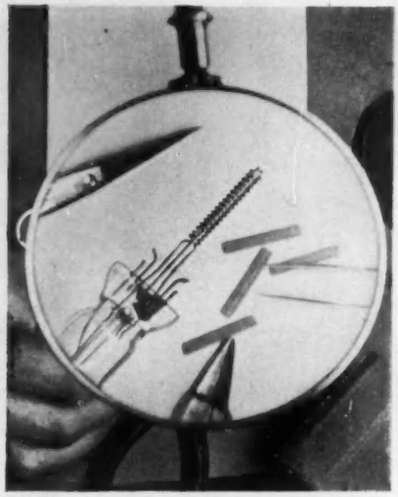

Fig.2—Photographed through a magnifying glass, this is the filament of a radio tube with a short piece of ordinary spaghetti inserted inside the wire coil.

found that spaghetti can be made with fair precision and is strong enough not to break if handled carefully; it can be machined on a lathe. For the first experiments, a stick of spaghetti was placed on a lathe and was machined to the correct diameter. The spaghetti maker now uses a die to enable him to produce sticks the correct diameter for the tube operation. From now on spaghetti is in war production.

Although spaghetti first was applied to the assembly of filaments for only one type of tube, Westinghouse officials plan to extend its use tc other types as soon as possible and make it a permanent practice.

Signal Corps WACS In N. Africa Praised

Because of the "cool efficiency and splendid morale" of the Signal Corps WACS in North Africa, the entire fixed telegraph and telephone communications throughout the rear areas in the Mediterranean Theatre could be manned by these feminine soldiers —if there were enough of them.

This is the opinion of Brigadier General J. J. Matejka, Chief of the Personnel and Training Service of the Signal Corps, and his views are shared by other Signal Corps officers who have returned from overseas and are further reflected in official reports to the Chief Signal Officer, Major General Harry C. Ingles.

"Today a number of WACS are serving in North Africa as telephone operators, teletypewriter operators, clerks and in other congenial capacities to the utmost satisfaction of commanding officers, many of whom are clamoring for more WAC personnel," General Matejka said.

Two-Way Electronic Train Telephone System Experiments Prove Success

Establishment in practical operation of a two-way electronic train telephone system, permitting continuous verbal communication with moving trains, between trains and between the head and rear of trains, was announced recently by the Pennsylvania Railroad.

The initial installation has been made on the 67-mile Belvidere-Delaware branch, running northward from Trenton, N. J. Officials stated that, while not yet adapted to general use, the new means of communication has now definitely demonstrated its capability of adding materially to the efficiency of controlling train movements. It has been produced in collaboration with a prominent Manufacturing Company, following several years of extensive experimentation and development, which are still continuing.

This unique system, the only one of its kind so far established, has been applied to the freight service on the branch, which is of substantial volume. It permits the crews of freight trains and block operators in wayside towers to talk to one another at any time for the transmission of orders, reports and information on matters affecting train operation. The conductor in the cabin car and the engineman in the locomotive cab may also talk to each other at will, and the crew of one train may communicate with the crew of another several miles distant.

The equipment required for the new communication system has been installed on 10 locomotives and 10 cabin cars, and in a block station at Frenchtown, N. J., 30 miles north of Trenton. Installation is also under way at another block station, where the branch leaves the New York-Washington main line.

Radio-Telephone Combined

The new system utilizes electrical principles employed in both radio and the wire telephone and combines the best practical advantages of both. It gives all the flexibility and ease of and wayside stations, between the ends of trains, and from one train to another, that would be possible with radio. At the same time, by utilizing transmission paths provided for its own special purpose and confined to railroad property, instead of the universal paths of nature over which radio waves travel, it obviates the necessity of appropriating radio wave lengths from the limited range available to the crowded and competitive sphere of radio communication.

In addition, it provides a solution for certain practical difficulties which were encountered in adapting pure radio to railroad use, and leaves the air to those forms of transport which have no physical ground contacts and to which radio has been found to be ideally adapted. Commenting upon the results thus observed, railroad officials, while emphasizing that the new system is still in the development stage, expressed the opinion that, when further perfected, its extension to other parts of the railroad will probably be found desirable. More extended experience on the Belvidere-Delaware branch, however, is considered essential, after which it is planned to experiment with the use of the new system in other territory where it would function as a supplement to automatic block signals, providing additional opportunity to study its practical advantages under varying conditions of operation.

The new system utilizes high frequency electric currents transmitted along the rails, and also along wires on poles parallel to the track. These are termed "carrier" currents and have impressed upon them the impulses of the telephone currents which are produced by talking into the telephone instruments. By means of apparatus attached to the locomotive and cabin cars, these telephone currents are received into and sent out from the trains and their electiral impulses are transformed back into sound by the telephone instruments at the receiving end, whether on a train or in a wayside tower.

No Operating Changes

Installation of the new system of electronic telephone communication, it was explained, has necessitated no change in the operating rules governing movement of trains over the branch. A considerable part of the gain in operating efficiency results

from the elimination of stops formerly required to enable train crews to get in touch with block operators through telephones installed along the tracks.

The block operator finds out by telephone from the engineman and conductor just what is occurring in their movements, keeps the train dispatcher fully advised and thus facilitates the planning of all train movements affected. When any change in conditions occurs, all persons interested are promptly advised and advantages are taken on the instant, reducing delays which otherwise would occur if wayside telephones had to be used for reporting the circumstances.

The Belvidere-Delaware branch runs along the east bank of the Delaware River from Trenton to Manunka Chunk, N. J., where it connects with the Delaware, Lackawanna and Western Railroad. Originally it was a subsidiary of the historic Camden and Amboy Railroad, now a part of the Pennsylvania Railroad system. It provides an important freight link with lines serving eastern New York state and New England, and is of special value at the present time in affording an auxiliary route for the movement of war traffic.

The Bell Telephone System had a gain of 1,200,000 telephones in 1943, bringing the system total above 21,000,000 with the figure for the entire industry in the United States going over 26,000,000.

Completes His Job, Retires

Edward A. Reese, cable tester in Des Moines for the Northwestern Bell Telephone Co., retired Feb. 1 with a service record of over 34 years. But before his retirement Mr. Reese completed the job of leaving no taped openings in the cable plant at Des Moines. They had all been permanently closed by the end of 1943. The Northwestern Bell magazine carried a picture of Mr. Reese with the sign "no taped openings" in their issue for February. He spent his entire telephone career at Des Moines with no absence because of sickness reflected in his service record.

Opens Wisconsin Sales Office

W. S. Pedley, who has been connected with the Highway Trailer Company for the past several years, is now handling the American Coach & Body Company line of Public Utility Equipment for the central states.

Mr. Pedley is now connected with the Equipment Sales Company, 16 North Carroll Street, Madison, Wisconsin.

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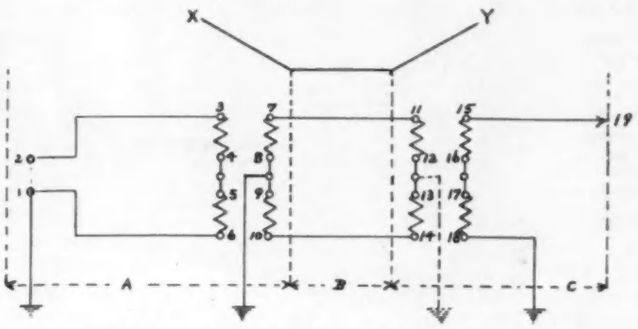
To Reduce Noise Caused By REA Interference

By JAY G. MITCHELL



Metallic Section to Reduce R.E.A. Inductive Interference.

Q. Please give me the diagram for connecting a repeating coil in a grounded telephone line to reduce noise caused by an R. E. A. electric line. Of course this is only a makeshift but it might help.

A. A large number of inquiries have been received bearing upon this subject evidencing, in all probability, the efforts being made by telephone operating companies to eliminate one common case of impaired service on grounded return single wire circuits. Because of the number received this inquiry has been selected as one which affords the opportunity of setting out the theory of reducing inductive interference in general. In many cases when the principles involved are understood necessary specific expedients may be devised and by trial and error methods progressive improvement may be realized. Especially difficult cases are always likely to be encountered and specific and detailed on the spot studies may often be necessary. Properly transposed and carefully constructed metallic circuits should always be planned for early installation on important and profitable circuits however.

It is to be assumed that this inquiry refers to the method of reducing interference in which that segment involved in the parallel with the disturbing supply circuit is made metallic, carefully balanced, properly transposed and then connected by repeating coils with those segments of the circuit which have been, for economical or other reasons, continued in operation as single wire grounded return circuits. On this basis the reduction in the interference by induced current from the paralleling supply circuit is mainly due to the transpositions systematically cut into the portion of the circuit which has been rebuilt as a metallic circuit for that purpose. Some of the interference is also due, in most cases to the **longitudinal** induced current in both wires of the metallic segment of the circuit and this component of the interference is reduced, if it is reduced at all, by draining the induced currents to earth before they can be passed into the grounded segments of the telephone circuit in the form of noise causing induced currents.

Referring to the sketch in the figure the disturbing supply circuit is represented by the line "X", "Y" which parallels the telephone circuit between the terminals of the segment "B". The metallic portion of the circuit extends slightly beyond the length of the parallel "B" and one wire extends from terminal 7 of the repeating coil in the Central Office to terminal 11 of the repeating coil out on the line beyond the end of the parallel with the supply circuit. The other wire extends from the terminal 10 of the repeating coil in the Central Office to terminal 14 of the repeating coil out on the line. The two sides of the metallic circuit 7,

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DEPEND ON SUTTLE

11 and 10, 14 must be of the same ohmic resistance and must be carefully transposed so that each wire is exposed to the disturbing supply circuit and the nearer to it of the two sides of the circuit for the **same total number of feet.** If this object can be accomplished and if the relative positions of the supply circuit and the nearer and more distant telephone wire are approximately the same throughout the parallel then the induced voltage of one side of the metallic portion of the circuit will be approximately equal to and opposed to the induced voltage of the other side and their sum will be approximately zero. In other words, no noise causing induced current will flow through the winding 7, 8, 9, 10 of the Central Office repeating coil nor the winding 11, 12, 13, 14 of the repeating coil cut on the line. Since no noise producing current will circulate in the metallic circuit 7, 11, 12, 13, 14, 10, 9, 8, 7 no noise producing current will be induced in the winding 3, 4, 5, 6, of the Central Office repeating coil nor in the winding 15, 16, 17, 18 of the repeating coil out on the line and the noise due to induced current in the two sides of the metallic portion of the circuit will not be heard. The theory as outlined is subject to entire or partial failure because of many practical details. For illustration, if the current in the disturbing supply wire is not of the same strength and voltage throughout the length of the parallel, the balance is likely to be disturbed more or less with a resulting reduction in the degree of elimination of interference. Stub lines can easily create such an inequality in the characteristics of the supply circuit.

Further reduction in the degree of interference may be obtained by the connection to the repeating coils of a drainage ground such as shown in the figure connected to terminals 8, 9 and 12, 13. When the length of the parallel "B" is three miles or less the drainage ground connection at the middle terminal 8, 9, of the Central Office repeating coil may be effective in reducing the noise causing induced currents in the telephone circuit. When the length of the parallel "B" is more than three miles the ground drainage connection shown at terminal 12, 13 of the repeating coil out on the line will probably be required for best results. In the installation of repeating coils for the reduction of inductive interference the line sides of all repeating coils must be equipped with suitable protectors. The ground contact for such protectors should **not be the same ground contact** as is used for the repeating coil winding termination. This is because of the probability that otherwise current drained from the line wires, (and one of the prime duties of this type of protector is to drain off accumulating potentials from the line wires constantly) might, because of a high resistance ground contact, be thrown back into the grounded segments of the telephone circuit **causing** additional interference and audible noise.

In the figure, to avoid complicating the drawing, the transpositions in the metallic section "B" have not been shown and for the same reason the protectors have been omitted. The line at 19, of course, leads to the grounded telephone instruments of the subscribers and 1 and 2 are the switchboard terminals to which the line is connected. It is our sincere advice that telephone companies contemplating the type of circuit shown schematically in the figure, direct an inquiry to their telephone equipment manufacturer asking for advice and counsel as to the best type of repeating coil to employ and such other related data and information as the manufacturer will be very glad, we are sure, to supply.

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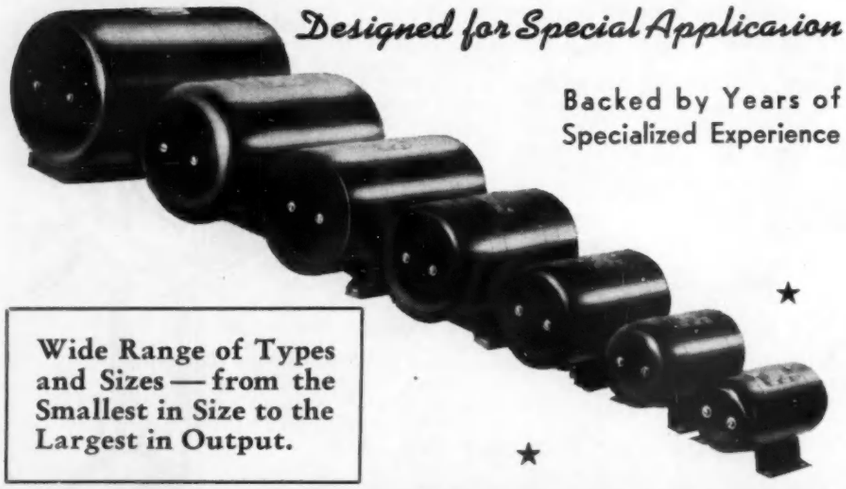

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Telephone Engineer

HANDBOOK TABLES

File—Pole Line Design
Date—April 15, 1944

Classes of Pole Lines—Equivalent Wire Factor

For the purpose of determining adequate pole strength, pole lines are classified according to the importance of the circuits carried as follows:

Class A—High grade toll lines with message mile capacity of 30,000 or more per day and lines of special importance such as radio broadcast network lines. Toll cable leads are also included in this classification. Those lines require the best available grades of construction and maintenance. The design safety factor of such lines is taken as one compared to other classes of lines.

Class B—Average grade toll lines with message mile capacity between 5000 and 30,000 per day. Design safety factor is such as to result in a line strength two-thirds that of the Class A toll line.

Class C—Low grade toll lines with message mile capacity of less than 5,000. Also exchange lines carried in cable. Safety factor of such lines is one-half that of Class A toll lines.

Class R—Exchange and rural lines with few circuits such as bracket and small crossarm leads. Safety factor is taken as one-third that of Class A toll lines.

Class J—Joint lines carrying both power and communication circuits on the same poles. Special rules for clearance between the two types of circuits apply to this class. Design safety factor is .88 compared to 1 for Class A poles. Joint construction generally requires the use of poles one size larger than those in leads carrying the same circuits only.

For computing pole strengths for various classes of pole lines which carry more than one type of conductors, as for example, open wire and cable, the different kinds of conductors are considered as being equivalent to one or more 104 wires. Table No. 1 gives the equivalent wire factor of various types of conductors and pole attachments for the three storm loading districts.

Types of Plant (One of Each Item)	Equivalent No. of 104 Wires		
	Heavy Loading District	Heavy Loading District	Heavy Loading District
109, 104, .083 iron and copper wire	1	1	1
128 and 135 wires	1	1	1.3
Drop wire	1	1	2.5
25 to 150 pair cable	4	5	15
150 to 400 pair cable	5	6	22
400 to 1200 pair cable	6	7	30
Over 1200 pair cable	7	8	35
Cable Terminal	1	1	4
No. 0000 A.W.G. insulated power wire	1.5	1.9	6.3
No. 4 A.W.G.	1.3	1.5	3.7
No. 6 A.W.G.	1.2	1.4	3.1
No. 8 A.W.G.	1.1	1.3	2.5
Power transformer, Small	1	1	6
Power transformer, Large	1	2	9

Note: When designing pole lines for medium or heavy loading district, the shielding effect of the outside wires in a crossarm lead of more than ten wires should be taken into consideration. In such cases, multiply the actual number of open wires by 2/3 and then add the wire equivalent of the other type of conductors in the same lead to get the total wire load.

J. S. Reed, Jr.

Strong Financial Position of Kellogg Switchboard and Supply Co. Reported

James G. Kellogg, President of Kellogg Switchboard & Supply Co.

THE stockholders of the Kellogg Switchboard and Supply Company held their annual meeting March 28, at the Company's offices at 6650 South Cicero Avenue, Chicago. Directors re-elected to serve for the coming year were: John J. Bryant, Jr., Curtiss B. Camp, S. Ashley Guthrie, John B. Hooker, James H. Kellogg and James G. Kellogg.

In his report to the stockholders Mr. James G. Kellogg, president of the Company, stated that the Company had continued its participation in supplying equipment for the armed forces of the United States and that the requirements of the armed forces greatly increased the demands upon the Company during 1943 over 1942.

"We have continued to serve our regular customers" reported Mr. Kellogg, "in the best possible manner in spite of the difficulties due to the pressure of war business and I need hardly emphasize that their good will and understanding is appreciated."

Summarizing the Company's position at the present time, Mr. Kellogg said that the annual report of December 31, 1943, indicated a well balanced and sound financial condition. The net income for the year compares favorably with that of 1942. There were no major changes in the character of the business except in a greatly increased output.

He further stated that the net income for the year ended December 31, 1943 amounted to $332,114.28 after provision of $1,047,000 for federal income taxes. Thus $1.09 a share was earned on the common stock after providing for dividends on the preferred stock.

Mr. Kellogg paid tribute to the Company's employees and their contributions to the war effort, not only on the production lines but by their investments in War Bonds and their generous contributions to such organizations as the American Red Cross and Community Chest. Pride was also expressed in those hundreds of employes now serving our country's armed forces.

Following the stockholders meeting, the Board of Directors elected James G. Kellogg president; James H. Kellogg, executive vice-president and secretary; Harry C. McCluskey, treasurer; and Eddis Johnson, assistant treasurer and assistant secretary, for the ensuing year.

Realizing the vitally important part in the nation's war effort which the operating telephone companies have undertaken . . . their responsibility to keep the lines open and standards of transmission up, in order to assist in the orderly yet hurried flow of materials, troops and supplies throughout the country . . . it is noted that the Kellogg Switchboard and Supply Company had inaugurated many worthy war-time aids for the industry's benefit during the year.

It is observed that on April 28, 1944, the Kellogg Switchboard and Supply Company will have completed its forty-seventh year of service to the Independent telephone industry.

C. S. Powell Elected Graybar Vice President

Effective immediately, Mr. Charles S. Powell will become a vice president and director of the Graybar Electric Company, according to an announcement received recently from Mr. A. H. Nicoll, Graybar's president.

Mr. Powell began his career with Graybar (then Western Electric Company) thirty years ago this June immediately after attending Stanford University and Case School of Applied Science where he was graduated in Electrical Engineering.

He was an officer and pilot in the U. S. Air Service during World War I. His experience with Graybar covered such assignments consecutively as student training course at Chicago, telephone specialist at Omaha, telephone, radio and appliance specialist

C. S. Powell, Vice President of Graybar Electric Company

at St. Louis, manager of Nashville, Tenn., branch manager of Louisville, Ky., branch, telephone sales manager at New York, New England district manager at Boston and, returning to headquarters at New York in September, 1943, as manager of Communications and Merchandising Departments. Mr. Powell will continue to head up all Company sales activities in Communications and Merchandising lines.

J S. Jammer, General Commercial Director, Fed. Tel. & Radio Corp.

J. S. Jammer Named

The appointment of J. S. Jammer as General Commercial Director of Federal Telephone and Radio Corporation, manufacturing affiliate of International Telephone and Telegraph

Corporation, was announced March 8. Mr. Jammer, who has been engaged in sales activities during the past 25 years for I. T. & T. companies throughout the world, will be in charge of Federal's sales and advertising.

Mr. Jammer assumes his new position fresh from a record production achievement as head of the company's Intelin Division, which is engaged in developing and producing high frequency cable for many wartime and commercial uses.

Among his technical contributions was Mr. Jammer's creation, by hand, of the first telephone carrier system at the research laboratories of the Western Electric Company in 1918. This model is now in the Museum of the Bell Laboratories.

Two New Developments By Cinaudagraph

As all users of permanent magnets know, every precaution has to be taken to prevent contact of steel tools or other ferro-magnetic pieces with the magnets. Momentary contact can permanently drain off an appreciable part of the magnet's energy content. The most common protection used by those assembling magnets has been to mold covers or shields of aluminum or other non-magnetic material to fit over the magnet. Such covers provided suitable protection but entailed considerable cost not only in materials but in the necessary dies.

Cinaudagraph engineers, being aware of the problems confronting the many users of these magnets, developed two entirely different types of covers which practically eliminated the use of critical material. Even with the crisis in aluminum passed, the Cinaudagraph methods of covering magnets continue to offer a greater economy, efficiency and saving in time.

The first of these developments was a low temperature cover; that is, a cover which would give full protection up to temperatures of about 350° F. This cover is formed by molding a dry, flexible plastic material saturated with a special solvent around the magnet by hand. The soaking gives it a "stretchability", enabling the operator to cover all parts no matter what shape or size or curvature of contours. When the magnet is suitably covered—a matter of only 2 to 4 minutes—it is placed in an infra-red or drying oven for a few hours. The tacky covering becomes thoroughly dry and firmly bonded to the magnet, forming a hard protective surface which no ordinary blow will crack and which is of sufficient thickness to prevent loss of energy content should a steel tool accidentally touch it.

This plastic base covering was found completely satisfactory for all conditions and temperatures up to about 350°F. Some of the war requirements, however, called for a cover which would withstand considerably higher temperatures without either sloughing off or disintegrating.

Cinaudagraph engineers, after investigating all available materials in the organic field wihch might stand up under high temperatures, turned to the inorganic. After testing numerous fabrics as well as other coating materials, they found a fabric which when soaked with a special inorganic solution could be molded readily around the magnet to give it protection. This operation, as with the plastic covers, takes only a minute or two. After the cover is smoothed into shape, it is usually given a second coating of the solution with a brush. The covered magnets are then dried in an infra-red ray oven. The covers on these magnets will withstand temperatures well above 700°F. They fully protect the magnet against contact with assembly tools.

You can cut up to 1½" branches easily with this TREE TRIMMER
This light weight, easy to use tree trimmer shears downward, taking advantage of gravity which spreads the cut behind the knife. There is no danger of wedging or choking. It's leverage ratio permits 1½ inch cuts with amazing ease. Extra extensions are spliced on by means of special ferrule and spring release. Get the complete details before you invest in tree trimming equipment.
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✓designed the way you want it
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Advertising Campaign on Postwar Economics

MANAGEMENT knows that postwar maintenance of payrolls depends in large part on the existence of reserves for paying wages and to buy equipment and materials during the change-over period. Government's policies indicate it believes the public is against industry's being permitted to build such reserves.

W. E. Ditmars, president, the Gray Manufacturing Company (formerly Gray Telephone Paystation Company), Hartford and New York, believes that if public opinion is to be effectively changed on this point, industry had better go to work on it quickly, and pull no punches. Most educational efforts in this direction, he feels, have been written stiffly, and from the manufacturers' not the workers' viewpoint. "Until we can reduce those principles of business management that are touched by government regulations to words that those who run may read and understand, we must expect to take a beating from government officials who represent, by and large, the opinions of the people. And the people will often hold opinions contrary to their own interests until they understand the principles involved. Simply stating these principles isn't enough, however; we must say them often, say them clear, and say them where millions will see and understand."

A series of full page advertisements was prepared and run in the Hartford newspapers. The Manufacturers' Association of Connecticut, one of the oldest associations of businessmen in America, thought so well of the ideas behind this campaign and the way they were presented that it offered to send reprints to all its members. It was then that the Gray company offered the campaign, lock, stock and barrel, illustrations and copy, to any manufacturer who wants to use it.

The Gray company feels that advertising of a local employer is much more fully read than that of an out-of-town organization because so many of the people either have a personal interest in the company or know someone who does. Gray knows that its advertising is but a small part of the big job of telling voters and workers industry's story. So, again with the cooperation of the Manufacturers' Association of Connecticut, this campaign was offered to daily newspapers all over the country. So far several dozen manufacturers have agreed to run the campaign.

Three Grand Fellows
The man in the Army
The man in the Navy
the man on the Home Front
AND WE ARE SERVING 'EM ALL
Of course — The Army and Navy comes first, but we're still taking care of the man who is doing his job here at home. And if we do run out of rooms before he asks for a reservation, we know he'll understand and appreciate our position.
We know he's busy, too, and short-handed and isn't traveling these days except of necessity. And if it's humanly possible, we'll take care of him as we used to do — and will again, after this war is over.
If your duties bring you to Fort Worth, please write, wire or telephone The WORTH for reservations.
JACK FARRELL, Manager
WORTH HOTEL
IN FORT WORTH

A Star for Copperweld's "E" Flag

In recognition of their production record for the Signal Corps during the past six months, the men and women of the Copperweld Steel Company were presented with a Second Production Award in February. This award gives them the right to fly the Army-Navy "E" flag with one white star.

Oliver Elects Officers

At the organization meeting of the board of directors of Oliver Iron and Steel Corporation, Mr. Ernest Schleusener was elected vice-president in charge of operations, and Mr. John P. Roche was elected secretary and assistant to the president. The other officers reelected were Theodore F. Smith, president; James C. Rea, vice-president; Henry Oliver Rea, vice-president; William F. Roll, treasurer; L. E. Uhrich, assistant secretary and assistant treasurer, and J. H. Lammert, assistant treasurer.

Mr. Schleusener (see photo) received his Bachelor of Science De-

Ernest Schleusener, Vice President in Charge of Operations of Oliver Iron & Steel Corp.

gree in Mechanical Engineering at Carnegie Tech. Since he joined Oliver he has served in various executive capacities in the plant. Since May, 1942, he has been assistant vice-president in direct charge of Engineering and Production Control. During 1943 he put into operation the Shell Plant of the Oliver Iron and Steel Corporation, manufacturing 37 and 75mm Armor Piercing Shot. He is an officer of Society for the Advancement of Management.

Mr. Roche was recently named Pennsylvania's outstanding "Man of the Year", by the United States Junior Chamber of Commerce. He is a graduate of Duquesne University and the University of Pittsburgh Law School. He is a director of the Junior Chamber of Commerce and also a director in the Pennsylvania State Chamber. Mr. Roche is an industry member of the Regional War Labor Board.

Stromberg-Carlson Awarded Second Star for "E" Flag

Three weeks after turning out the greatest month's production in the company's history, the Stromberg-Carlson Company, Rochester, N. Y., received notice of its award of the second star for the Army-Navy "E" pennant, Wesley M. Angle, president, announced during March.

"The entire Stromberg-Carlson organization, the workers at bench or machine or desk, the management and the stockholders, are honored through the award," Mr. Angle declared. "We are presently producing communication material for our armed forces at a rate which should mean that our contribution to the war effort in 1944 will well exceed our 1943 accomplishment, but there is likewise every indication that we must keep right on going without slackening our efforts. Our Stromberg-Carlson men and women have assured me that this they can be counted on to do."

Approximately 650 employes, who have joined the company since the award of the first "E" star last August, will receive "E" pins when the new star is added to the flag. Several thousand other employes received their pins when the "E" pennant was presented to the company in January, 1943.

Stromberg-Carlson production for February not only was the greatest the company has ever turned out, but it exceeded the concern's entire production for the year of 1940. Approximately 98 per cent of the company's wartime production is shipped in the form of radio, radar and communications equipment to the armed forces.

"This production record is a tribute to Stromberg-Carlson men and women, who have never lost an hour of war production because of labor difficulties," Mr. Angle said.

Gray Manufacturing Co. Awarded Army-Navy "E"

The men and women of the Gray Manufacturing Company, 16 Arbor Street, Hartford, Conn., were presented with the Army-Navy "E" for outstanding production of war materials and equipment at a brief, simple ceremony at the plant March 30. The company makes several products for the armed services, including equipment for recording and reproducing both speech and code.

Lt. Col. C. J. McIntyre, of the Office of the Chief Signal Officer, Washington, presented the award in behalf of Under Secretary of War Robert P. Patterson. The burgee was accepted for the Gray Company by president W. E. Ditmars, who is a graduate of the U. S. Naval Academy, and served in the Army during and following the First World War. He was joined in the acceptance of the

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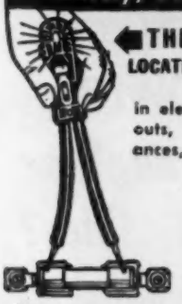

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burgee by Mrs. Harriet Flanagan, an employee of the Gray Company, who has two sons who are officers in the Army Air Forces, both of whom have been decorated.

Following the citation all the men and women of the Gray company took the following pledge:

"I promise to wear this pin as a pledge to every man in our armed services, that, until this war is won, I will devote my full energies to the cause for which they are giving their lives."

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